DECEMBER 18, 1937

ELECTRICAL WORLD

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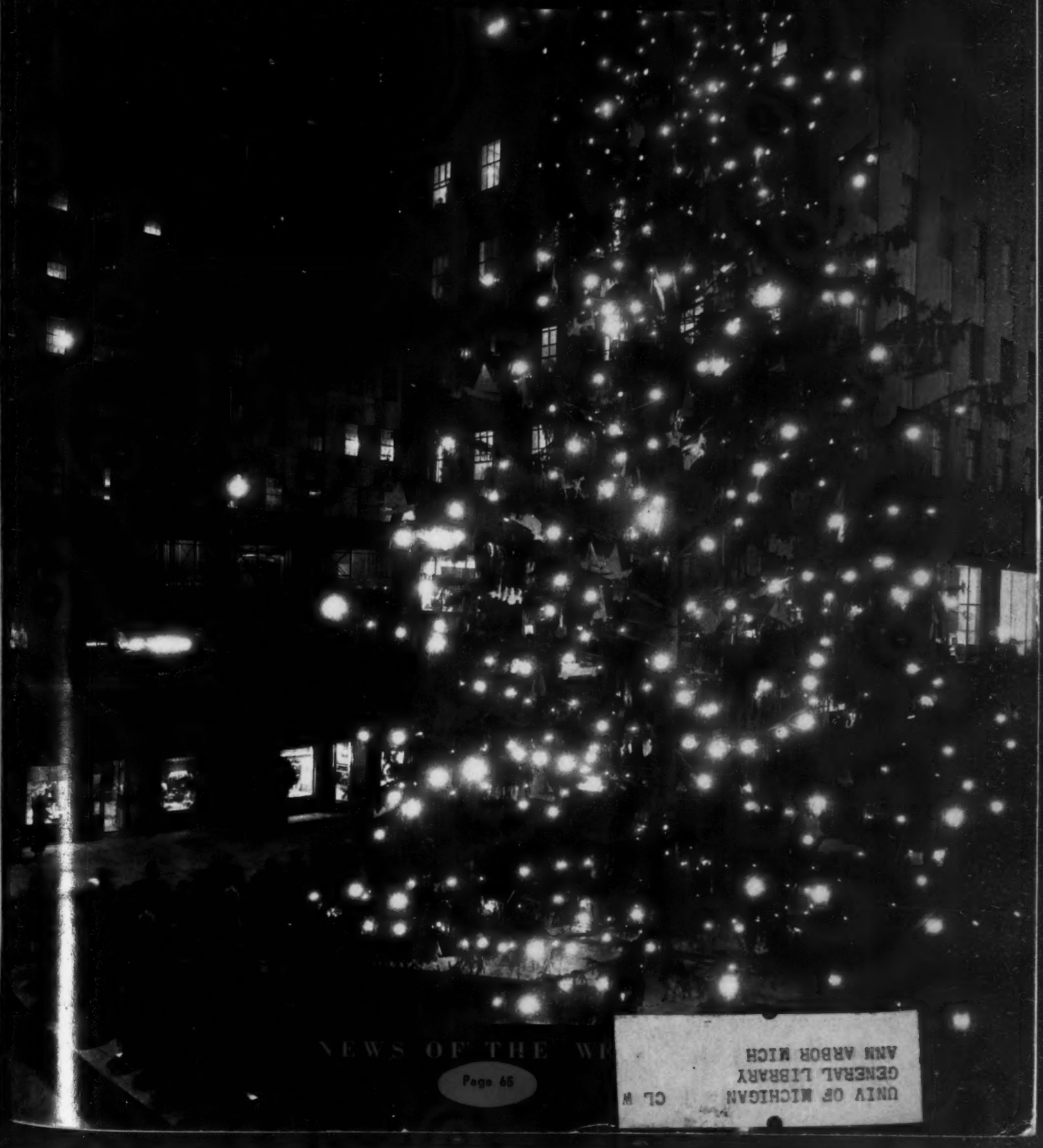

NEWS OF THE WE

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ELECTRICAL WORLD

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Coming Features

34th Annual Statistical Number

One of the features of this annual survey will be an analysis of prospective capital expenditures during 1938 for steam plants, hydro, transmission and distribution. Totals probably will not differ greatly from 1937, but there will be changes in allocation.

Selling Ranges and Water Heaters

Although situated in a low-cost natural gas territory, the Kansas Electric Power Company has been successful in selling electric ranges and water heaters. Its selling experiences and results will be presented in an early issue.

Lincoln Tunnel

Among the novel electrical features of New York City's new Lincoln Tunnel are four-speed drives for fans, tuned-frequency fan speed control, supervisory control of tunnel auxiliaries and modern tunnel and plaza lighting. Detailed description soon.

On the Cover

Christmas at Rockefeller Plaza, Radio City, New York.

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ELECTRICAL WORLD

DECEMBER, 18, 1937

Unified Industry Program Needed

Men close to the Administration are reproaching business and the utilities for not taking a more constructive attitude toward the President's program of conciliation. It shows a lack of intelligence, they claim, to meet a friendly overture with the charge of insincerity.

Perhaps it does, and yet, on the other hand, the utility industry, which was willing to co-operate with the Administration in almost any practical way that would help to restore confidence in the industry's investments, was stunned by the release of the New York Power Authority water-power report simultaneously with the first of the President's utility company executive conferences. When an aggressor has been fighting another for some time he cannot expect the sincerity of his peace offerings to go unquestioned if unfriendly actions that are within his control are permitted to continue—at least during the period of truce.

However, the utilities can afford to be forgiving on that point, for the untimely publication of that New York Power Authority report has hurt rather than helped the Administration. In fact, no matter what happens, this is no time for the utilities either to carry a chip on the shoulder or to shrink from making efforts to co-operate. To the contrary, they should see here an opportunity to regain public esteem by doing their utmost to arrive at a quick, harmonious settlement of their difficulties with the Administration.

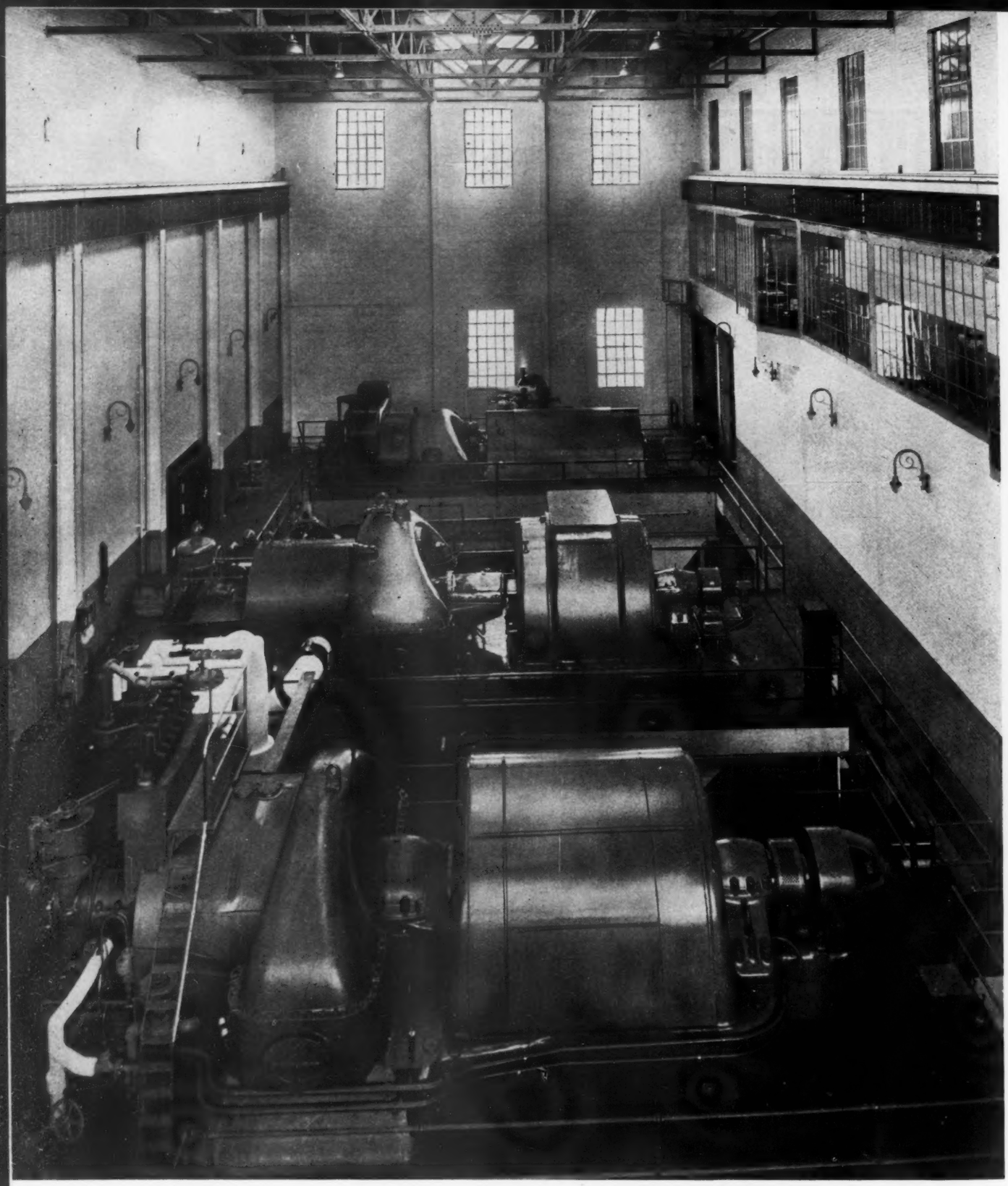
There can be no doubt but what the public attitude toward utilities is improving all the time. This is reflected in the daily press, in national magazines and among the members of Congress. Even in the ranks of Washington bureaucracy there is a more sympathetic feeling toward the utilities.

All Washington believes that any encouragement for the utilities must first come from the White House. There is every reason to believe that Congress would not hesitate to vote for modifications in legislation that has proved hurtful to utilities provided it had some assurance that the President would approve. So far he has given no indications of having any definite plan or program for alleviating the industry's problems.

Since the President has announced to the press that he expects to resume the conferences with utility executives next week, it is possible that he is waiting for a program that carries the indorsement of a substantial portion of the utility industry. It is doubtful if such a program would differ much in substance from that already submitted by Mr. Willkie of Commonwealth & Southern and which has received a most favorable public reception. Nevertheless, it is quite conceivable that a program offered by one who not only is known to have the respect and confidence of the utility industry and who is the head of a sizable utility that is not directly affected by the death sentence clause, government competition or TVA might be more acceptable to the President.

In any event, the industry by indorsing some practical program that can be accepted by both sides will not, should these conferences come to naught, find itself in the position where it can be blamed by the Administration for not evincing a desire to co-operate when the olive branch was held out.

The public believes that the utilities could be a major factor in ending the current business recession by engaging in a billion-dollar construction program, or twice their 1937 capital expenditures. The utilities have no hesistancy in saying that the money with which to finance such a program would be readily forthcoming if the government would stop certain practices and modify certain legislation. In return, the utilities are willing to accept such regulation as will prevent abuses against which the government was aiming and will undertake to market government generated energy in a mutually satisfactory manner.

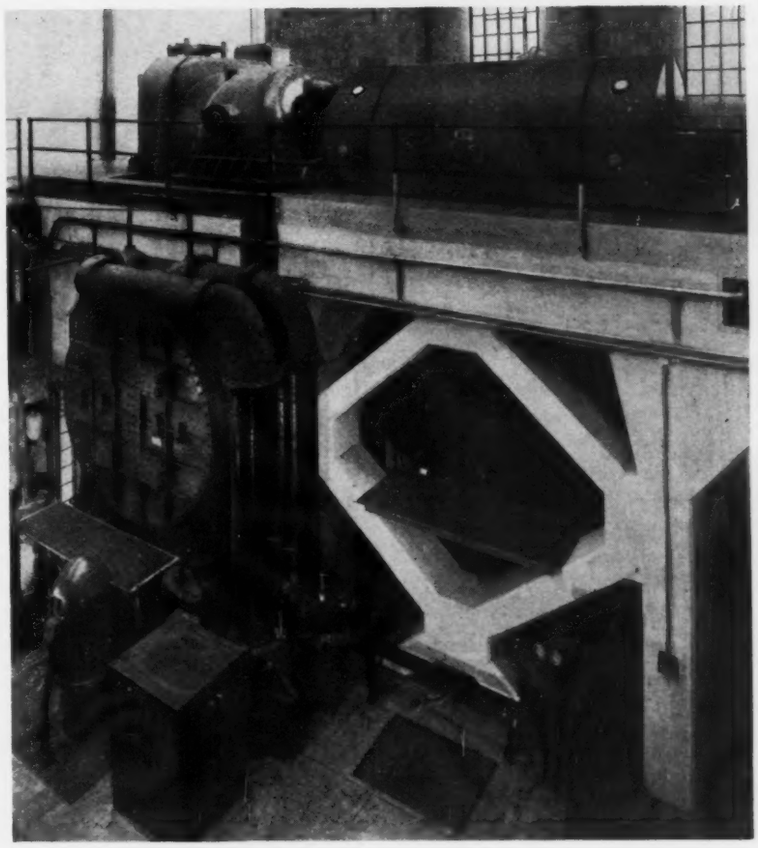


TURBINE FLOOR AT MONTVILLE

The new 25,000-kw. turbo-generator unit recently installed in Connecticut Light & Power Company's Montville station is shown in the extreme background.

Flexible Operation Montville Keynote

Plant Expansion Strengthens Primary Power Resources of Connecticut System—Efficient Utilization of Equipment



THE Montville steam station of the Connecticut Light & Power Company, on the Thames River in eastern Connecticut, has become more of a key station than ever with the recent addition of a 25,000-kw. steam unit and accompanying boilers and equipment to serve the company's system, and in particular the eastern part of the state. Originally constructed in 1918 with two 10,000-kw. generators running at 1,800 revolutions on 265-lb. steam, the station was doubled in size in 1924 when a third 10,000-kw. generating unit was installed and provision was made for the future installation of a fourth 10,000-kw. unit.

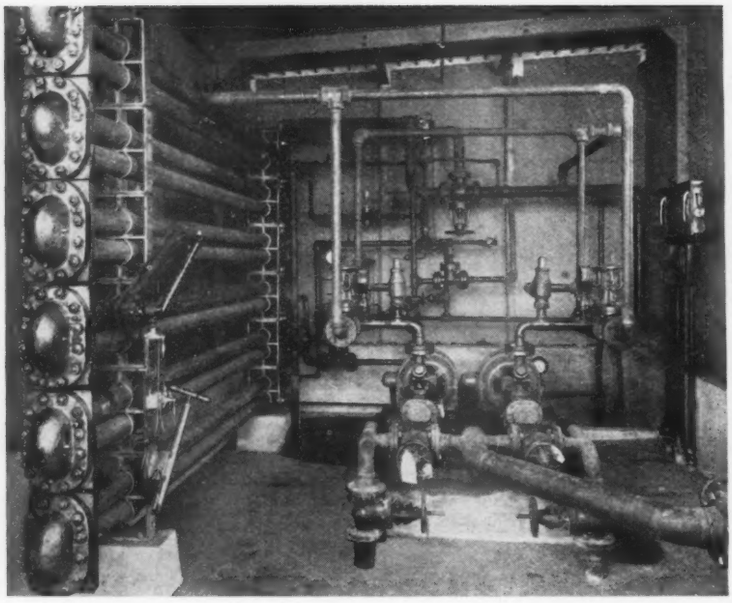
The station is one of the two steam plants and three main hydro plants that supply most of the energy the C. L. & P. Co. system requires and is connected to the load center of the system—the highly industrialized western half of the state—by a 66,000-volt, single-circuit tie line which runs 40 miles to Meriden, where connection with the western area is made. It supplies energy directly through two 66,000-volt lines to the north and central sections of eastern Connecticut and to the southeastern part of the state through 33,000-volt lines.

Latest addition at Montville is a 25,000-kw. condensing unit. This addition is the base load unit for the system, which serves directly and indirectly 67 per cent of Connecticut's area. Seven per cent more of Connecticut's area is served directly by the company with purchased power obtained from other sources.

Present peak loads at Montville run around 24,000 kw. and the maximum anticipated in the near future is approximately 30,000 kw. Should one of the Montville units be down for overhaul there is adequate capacity in the station to take care of primary power requirements in the eastern area without drawing energy over the Montville-Meriden line from the other stations in the system. The transmission capacity of this tie line is slightly in excess of 25,000 kw.

25,000 kw. fitted into 10,000-kw. space

Chief aim of the designers of the new unit was to produce electricity on the 66,000-volt bus at the lowest cost from the standpoint of the company's system requirements. To this end, it was decided to make use of existing facilities which might be utilized in the new installation. This led to selecting Montville station as the location for the new unit, for here, ready at hand, were a building, foundations and other facilities for the boilers, turbo-generator and condenser storage and handling arrangements for tidewater coal and plenty of condensing water. Provision having been made in 1924 for the future installation of a fourth unit of 10,000 kw., the problem in 1935 resolved itself into fitting 25,000-kw. equipment into space that had been designed a number of years before for a 10,000-kw. installation. This implied limitations which affected basically the selection and design of the equipment.



Left—Interior of oil pump house with cross-connected units. Right—Pulverizing mill unit for new boilers, each boiler being served by two

Striving for lowest-cost kilowatt-hours delivered at the bus led to seeking for the best over-all efficiency from the entire unit—from coal pile to the 66,000-volt bus—as distinguished from endeavoring to achieve the highest attainable efficiency from individual components.

The boilers

The new installation, including the two boilers, is practically a complete power plant in itself and is almost entirely distinct from the old installation in the same station building.

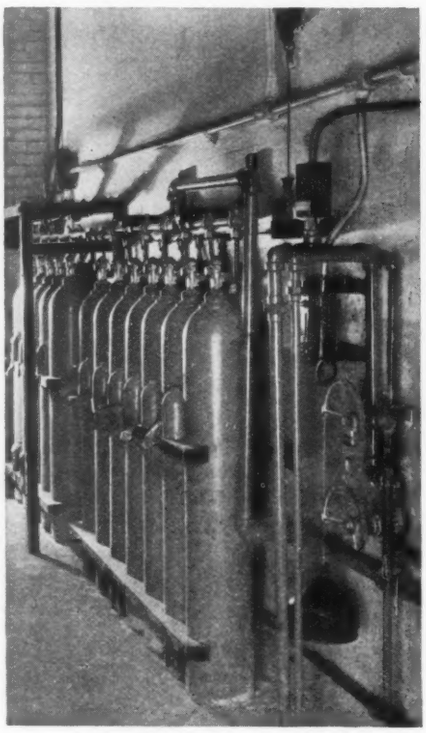
The two new boilers supply steam only for the new generating unit and each generates in excess of 130,000 lb. of steam per hour at 650 lb. pressure and 825 deg. F. steam temperature. They were designed for operation at 850 deg. if found desirable. The boilers are of the three-drum, bent-tube type and the furnaces are completely water cooled. The latter are equipped with slag screens for the "dry" removal of ash. Furnaces and boilers are proportioned so that fuels with an ash fusion temperature as low as 2,000 deg. F. may be burned without difficulty. At the time this article is being written, experience with the boilers has established that these characteristics are being realized.

Each boiler has 9,100 sq.ft. of boiler heating surface and 2,000 sq.ft of water-wall heating surface. The latter consists of the exposed surfaces of the water tubes, which, together with the heat-insulating materials back of the tubes, form the four side walls of the boiler furnace and the water screen between the bottom of the furnace and the ashpit. The fire space in the furnace measures 6,200 cu.ft.

Coal is powdered

Coal from the Virginia mines is brought to the station in 4,000-ton colliers up the Thames River. In case of emergency, coal may be shipped in by rail. Conveyors raise the coal from the storage in the station yard to the intermediate-storage bunker, which extends the full length of the station and serves all boilers in the station. The coal storage in the station yard is adequate to care for 45,000 tons, approximately four months' normal requirements.

As normally operated, the boilers are fired with powdered coal that is mixed with preheated air before firing. Between the coal bunker and the burners which deliver the coal-air mixture to the boiler furnace are four identical coal processing and mixing equipments, each comprised of a coal scale and an almost vertical coal shute, a small and secondary hopper, a coal feeder (which regulates the amount of coal that is fired), a mill and a burner. There are two such equipments for each boiler. The scales are in the usual position—immediately below the bunker and at the upper end of the chute. The latter discharges into the secondary hopper, which, together with the coal feeder, is located on the operating floor of the boiler room. The mills are in a separate room on the ground floor of the station, 20 ft. below the boiler room operating floor.



Central battery of CO_2 cylinders for fire extinguishing service

Each mill and its accompanying burner have capacity sufficient to process the coal required for generating approximately 80,000 lb. of steam per hour. In order to avoid explosion hazards, the room below the boilers in which the mills are located is isolated from the forced-draft fans of the older part of the station that are installed on the same ground floor level. The pipe which delivers the powdered coal with some preheated air from the exhaust fan on the discharge end of the mill to the burner in the boiler is only a short run. It is the only section of piping that carries a mixture of powdered coal and air under pressure. Thus, the leakage of powdered coal is reduced to a minimum.

Preheating the Air—Air that is mixed with the pulverized coal is drawn by a blower from the upper levels of the station and forced into a revolving air heater placed on top of the boiler.

The air heater, with a plate surface of 19,400 sq.ft., utilizes the heat in the flue gases discharged by the boiler. The blower is mounted on an upper floor above the boiler and has a capacity of 40,000 cu. ft. per minute. There is an air heater and a blower for each boiler.

A small part of the preheated air is taken off the main duct by a branch duct that connects with the barrel of the mill. The mixture of this smaller volume of preheated air and the powdered coal is drawn from

the mill and blown up into the burner by the exhaust fan referred to above, which forms part of the mill and is driven by its main shaft.

Provision Made for Burning Oil—Each burner in the boiler furnace is also equipped for burning fuel oil. Thus, the boiler may be lighted and started on oil and may be operated on this fuel if desired.

No. 4 furnace oil is now being used in order to avoid heating the oil. However, oil storage tanks, pumps and heating equipment have been installed in order that the heavier grades of fuel oil may be burned. This equipment is in a small building a short distance away from the station building. It is adequate to handle the fuel for generating approximately 120,000 pounds of steam per hour when only oil is burned.

Circulating Water Tunnels Modified—At the time the Montville station was enlarged a second set of intake and discharge tunnels was constructed for serving the 10,000-kw. unit installed at that time and the fourth unit to be installed at a later date. This set of tunnels was utilized for the 25,000-kw. unit and continues to serve the 10,000-kw. unit as well.

Stationary screens were installed in the screen well in 1924. On account of the larger quantity of water that the new unit requires and dependability being highly essential, screens of the revolving type have been installed in the well in place of the stationary screens. The revolving screens are housed in a building extension which also shelters the sump into which is discharged the water-and-ash mixture from the new boilers and from two older boilers.

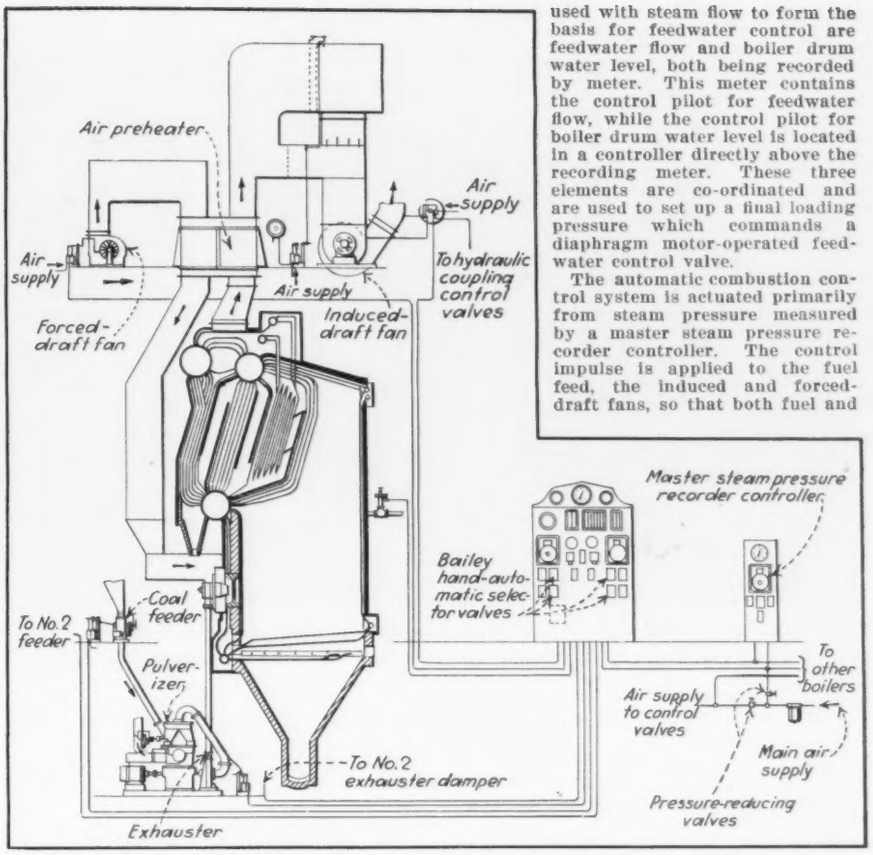
Flyash collected

In a powdered coal installation such as this approximately 70 per cent of the ashes produced by combustion in the boiler furnace are fine ashes carried upward by the flue gases; the other ashes fall directly into the ash hopper below the boiler. Hence, more than ordinary provision must be made to remove as much of the fine ashes as possible from the flue gases before the latter pass out into the atmosphere.

In the new Montville installation this is accomplished by so-called "dust collectors" on the station roof, one for each boiler. Most of the fine ashes having been eliminated by the "dust collector," the cleansed flue gases pass out into the atmosphere through a 50-ft. unlined steel stack. Seven to eight tons of fine ashes are separated daily from the flue gases given off by each boiler.

These ashes drop about 80 ft. down a vertical chute into the ash hopper on the ground floor of the station. This hopper also receives the ashes that drop through the water-tube screen of the boiler furnace. So, practically all ashes, whether they rise with the flue gases or drop out of the furnace, find their way to the same ash hopper.

The latter is emptied periodically by sluicing the ashes into a trough cut into the floor and half filled with running water. The water-ash mixture flows into a collection pit, from which it is pumped through a pipe line to a shallow bay at the north of the dock, where the ashes are used for filling. An ejector provided with a high vacuum is used to remove ashes that collect at various points on the boiler, such

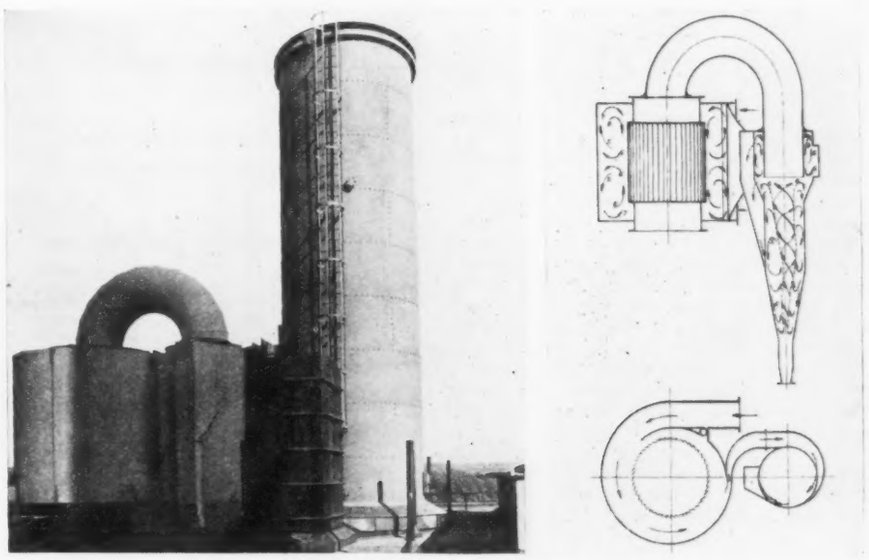


used with steam flow to form the basis for feedwater control are feedwater flow and boiler drum water level, both being recorded by meter. This meter contains the control pilot for feedwater flow, while the control pilot for boiler drum water level is located in a controller directly above the recording meter. These three elements are co-ordinated and are used to set up a final loading pressure which commands a diaphragm motor-operated feedwater control valve.

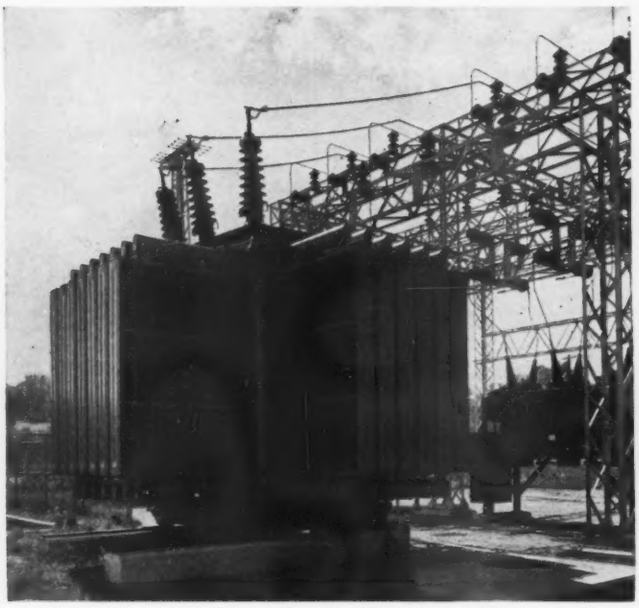
The automatic combustion control system is actuated primarily from steam pressure measured by a master steam pressure recorder controller. The control impulse is applied to the fuel feed, the induced and forced-draft fans, so that both fuel and air to all boilers are controlled simultaneously in response to steam pressure changes. As previously mentioned, the induced-draft fan speed is readjusted by the boiler motor to maintain most economical combustion conditions and the forced-draft fan is readjusted by both the boiler meter and the furnace draft so that the desired furnace draft is maintained at all times during the operation.

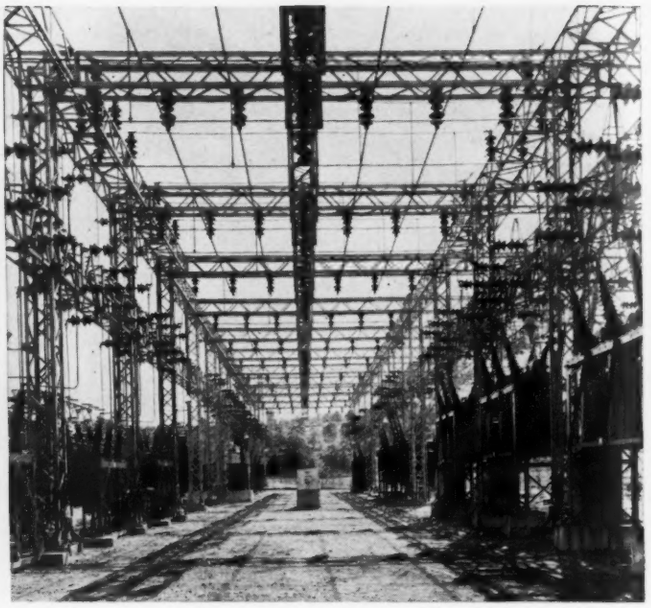
Each boiler is furnished with metering equipment for steam and air flow measurement, with a control pilot valve to readjust the induced-draft fan speed, thereby controlling the quantity of air flow through the boiler to maintain optimum combustion conditions at all times. The boiler meter also serves as the steam flow measuring instrument for the three-element feedwater control system. The two other elements

Cross-section of boiler installation showing combustion control system



New stack and housing for dust collector system at left
Skeletonized view of dust extraction unit at right





Left—Step-up transformer for new generating unit; generator leads are solidly tied into primary winding terminals. Right—Outdoor switch and bus structure for 66-kv. transmission service

as from the hoppers, under the last boiler pass and from the bottom of the stack. All of this material and dust collected by the boiler room vacuum cleaning system is delivered to the collection pit in the screen house.

The "dust collector" for each boiler is comprised of a primary concentrator stage and a secondary highly developed form of cyclone stage. The gas to be cleansed enters the primary tangentially. About 85 per cent of the gas is discharged axially and the remainder is shaved off of the volute casing for passage to the secondary stage. At this point the dust is steadily shaved off from the concentration zone in the top cylinder and passed down through an outside duct into the middle cylinder of the cyclone so that the lower half of the double-eddy current promotes the travel of this dust to the bottom dust outlet. The gas from the secondary is thus discharged through the top outlet and passed through a cross-over duct for discharge through the central outlet of the primary.

The primary is equipped with an inlet control damper operated by the boiler control system, so as to throttle at fractional loads in order to maintain uniform rim velocity. The interior of the primary is equipped with a ring of variable vanes through which 85 per cent of the gas passes for axial discharge. These vanes are pivoted and their motion is associated with the inlet damper, so that with diminishing loads the angle which each vane makes with the tangent of the vane circle is reduced. The chief object of this control is to send a uniform flow of gas to the secondary under all load conditions so the cyclone may consistently operate at peak performance. The "dust collector" is designed to collect at least 97 per cent of the summation of particles above 44 micron size (325 mesh), 90 per cent of particles above 20 micron size (sub-mesh 625) and 80 per cent of particles above 10 micron size (sub-mesh 1,250).

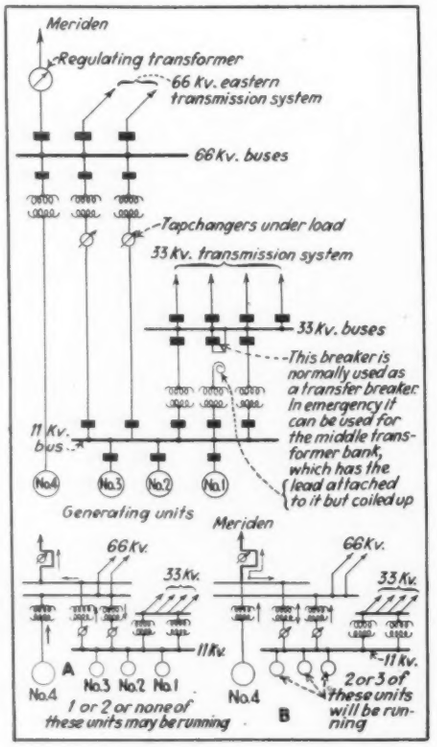
Boiler is automatically controlled

Under normal operating conditions the boiler functions by virtue of automatic control. Also, it may be controlled manually by manipulating the controls on the boiler control panel. Each control panel—there is one for each boiler—carries recording instruments that show steam flow, water flow, air flow, boiler water level and air, gas and steam temperatures respectively. Common to both boilers is a recording steam pressure gauge.

Combustion control equipment is pneumatically actuated, largely through an air pilot valve attached to the recording steam pressure gauge. This valve controls the basic air-loading pressure which governs the speed of the induced-draft fans, the temperature setting of the forced-draft fans and the rate of fuel supply. The speed of the induced-draft fan is also subject to secondary adjustment in order to maintain the proper ratio between air flow and steam flow. Similarly, the forced-draft pressure is automatically readjusted to maintain the proper furnace draft.

The feedwater control valve is actuated by steam flow in much the same way to the end that the water flow may be approximately equal to the steam flow. Their relationship is governed by the boiler water level. Both steam-flow and water-flow meters are equipped with integrators that register totals for the purpose of checking operating results.

Temperature of the steam is controlled by regulating the volume of the flue gases that pass over the superheater surface. Thermocouples in the steam header record the steam temperature. Contacts on the temperature recorder actuate an electric motor that opens and closes the dampers in the superheater bypass. Entirely apart from the system of co-ordinated control, another control regulates the supply of preheated air to the mills. It may be said in general that the recording instruments furnish all the data required for plant operation and the integrated readings are the only additional information necessary for a complete operating record.



Schematic diagram of use of regulator transformer installation

Piping—All piping for the new installation except minor items was laid out and designed even in detail on the scene of ultimate installation and then was prefabricated by the manufacturer in the factory. Welds in the high-pressure steam and boiler feed piping that were called for in the field were thus kept down to an absolute minimum. In consequence, little welding and refitting at the scene of installation was called for.

[*Continued on page 106*]

Unit Installation Costs for White-Way Lighting

By J. B. PRINCE

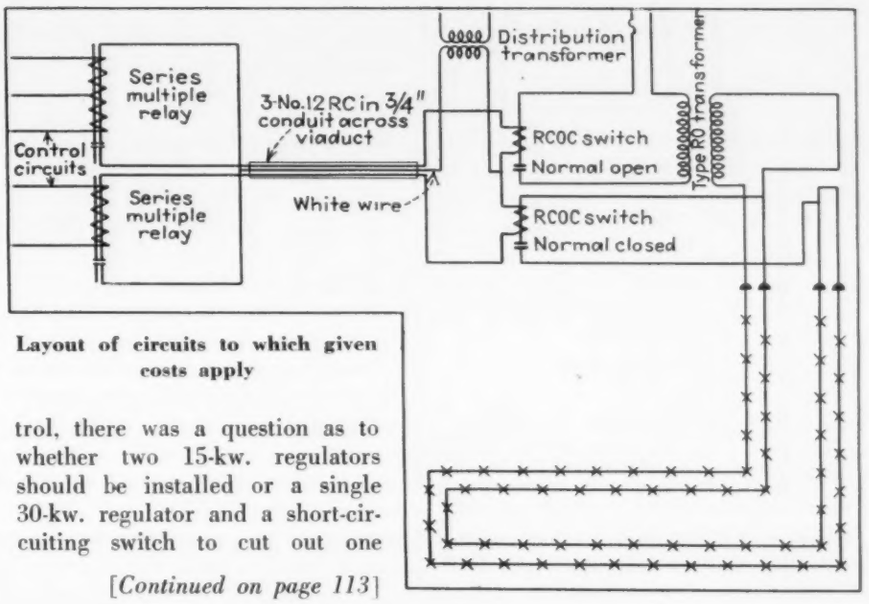
Sioux City Gas & Electric Company, Sioux City, Iowa *

A RECENT "White-Way" street-lighting installation job consists of seventy electroliers in two circuits, one for all night and the other for evening operation. The installation of standards, complete with transformers and glassware, was done by the municipality. The costs here given are only for service to the standards.

There was a 500-ft. viaduct between the closest existing circuit and the proposed circuits which eliminated the possibility of cascading them directly from the other circuit economically. However, it was decided to install two SR-1 relays on the west side of the viaduct and run a ¾-in. conduit line with three No. 12 wires across the viaduct and up a pole to operate the control equipment.

Since there were two circuits to control, there was a question as to whether two 15-kw. regulators should be installed or a single 30-kw. regulator and a short-circuiting switch to cut out one

[*Continued on page 113*]



Layout of circuits to which given costs apply

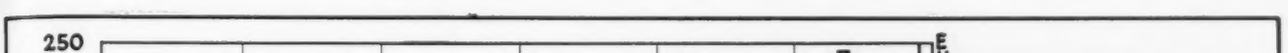
* From paper to Missouri Valley Electric Association.

Street-Lighting Electrolier Installation Costs

	Description	Labor	Transportation	Superintendence	Total Lt. & S.	Labor Unit	Material	Total Cost	Unit Cost
A— Installing relays	2–SR–1	$36.44	$4.80	$2.22	$43.46	$21.73	$70.92	$114.38	$57.19
B— Installing RCOC switches	1–AN and 1–RM	90.95	12.20	5.55	108.70	54.35	163.88	272.58	136.29
C— Removing concrete sidewlka	477 ft	48.70	6.55	3.20	58.45	0.1220	.....	58.45	0.1220
D— Removing brick sidewalk	564 ft	12.88	1.73	0.85	15.46	0.0270	.....	15.46	0.0270
E— Removing concrete street	16 ft	4.78	0.64	0.30	5.72	0.36	.....	5.72	0.3600
F— Removing brick street	17 ft	2.73	0.37	0.18	3.28	0.193	.....	3.28	0.1930
G— Excavating for cable	4,745 ft	192.13	25.90	12.00	230.03	0.0485	.....	230.03	0.0485
H— Excavation for pushes	51 pushes	59.34	7.98	3.50	70.82	1.39	.....	70.82	1.39 ea.
I— Pushing pipe and removing	51 at 40 ft. ea. 2,040 ft.	194.34	26.20	13.57	234.11	4.60	22.43	256.54	5.03
J— Backfilling and tamping	4,745 ft	199.72	23.50	10.00	233.22	0.0492	.....	233.22	0.0492
K— Replacing concrete sidewalk	477 ft	24.14	3.24	1.60	28.98	0.061	55.83	84.81	0.1780
L— Replacing brick sidewalk	564 ft	47.06	6.33	2.75	56.14	0.10	.....	56.14	0.10
M—Replacing concrete street	16 ft	1.00	0.13	0.06	1.19	0.075	2.00	3.19	0.20
N— Replacing brick street	17 ft	2.73	0.37	0.17	3.27	.....	.....	3.27	0.193
O— Barricades and lanterns	90 days	33.03	4.48	2.00	39.51	.....	5.51	45.02	.....
P— Running conduit across viaduct	490 ft.-¾ in	34.85	4.69	2.05	41.59	0.085	41.31	82.90	0.169
Q— Running conduit up pole	20 ft.-3 in	12.33	1.34	0.60	14.27	0.715	6.79	21.06	1.05
R— Misc. not included in above		55.55	7.50	3.00	66.05	.....	71.97	138.02	.....
X— Installing 30-kw. regulator and accessories	30 kw. regulator	25.00	2.70	1.00	28.70	28.70	720.00	748.70	748.70
Conductors									
S— Running wire across viaduct	500 ft. 3–1/c No. 12–1,500 ft	13.93	1.87	0.80	16.60	0.0331	12.00	28.60	0.0573
T— Installing electrolier cable	15,525 ft	173.27	23.25	11.00	207.52	0.0133	2,229.42	2,436.94	0.157
U— Splicing electrolier cable	6 splices	17.82	2.40	1.10	231.32	.....	2.76	24.08	4.01
V— Connecting transformers	70	113.54	15.30	7.00	135.84	1.94	11.42	147.26	2.10
W—Misc. not included in above		8.85	1.18	0.50	10.53	.....	.....	10.53	.....
Total		$1,405.11	$184.65	$85.00	$1,674.76	.....	$3,416.24	$5,091.00	.....
Plus 8 per cent		.....	.....	.....	.....	.....	.....	407.28	.....
Total		.....	.....	.....	.....	.....	.....	$5,498.28	.....

Cost per unit — $78.55

Labor taken from daily time slips. Transportation prorated in direct proportion to labor. Supervision — Labor and transportation of supervisor charged to this job and prorated according to labor. Material — actual cost of material. Overhead — 8 per cent.



Wisconsin's Power Needs to Double in Ten Years

Co-ordination Study Shows Value of Interconnection—Hydro Available, but Location and Steam Flow Are Unfavorable—Large Replacements Not Expected

IT IS only by exhausting the possibilities of interconnection that the electric utilities can gain the benefits of staggering construction of new capacity, centralized generation in efficient plants at economical locations, increasing the reliability of service, utilizing existing generating facilities more efficiently, taking advantage of diversity and supplying mutual assistance should capacity be needed in emergency. This was the conclusion of the exhaustive report on "Co-ordination of Electric Power and Transmission Facilities in Wisconsin," made last month by the technical subcommittee to the general committee of the Wisconsin Utilities Association.

The central station industry of Wisconsin has an installed generating capacity of 949,241 kw., divided as follows:

Steam	672,760 kw.
Hydro	263,010 kw.
Internal combustion	13,471 kw.

Of this total, 36,810 kw. is installed in plants in border territory in neighboring states.

Steam stations are the main source of power in Wisconsin. They generated 61.3 per cent of the total output in 1936, as compared with 38 per cent by hydro and 0.7 per cent by internal combustion engine plants. In the same year power purchased from utilities outside the state and industrials in the state approximated 6.8 per cent of the total generated and purchased output.

Next to steam, hydro is the most important power supply. The typical hydro plant in Wisconsin is in the low-head class and is limited by available water. The flow of Wisconsin rivers is such as to produce a surplus of power in wet seasons and a deficiency in dry seasons. Over a six-year period, hydro output has varied from a low of 31,600,000 kw.-hr. in August, 1934, to a high of 136,000,000 kw.-hr. in May, 1936. Fuel-burning plant standby is therefore a necessity to firm up hydro generation.

While undeveloped hydro sites are still available, they would not provide sufficient capacity to take care of the state's future load growth. Also, they are remote from probable markets. These factors, together with higher costs, are unfavorable for their development.

Existing hydro power in the state should be co-ordinated with steam power to obtain a lower over-all system cost. With increasing loads, further interconnection of this nature may become feasible.

Most of the newer and larger steam plants have facilities for increasing their capacity. Before the end of 1938, the total generating capacity will be increased by 33,700 kw. of steam and 19,000 kw. of hydro capacity.

There are about 6,000 miles of transmission circuits in the state, as follows:

Circuit Miles	Voltage
550	132,000
339	110,000
100	88,000
3,700	66,000 44,000 33,000
1,300	26,400 22,000

These lines are interconnected and linked with power sources by 1,150,800 kva. of substation capacity.

Interconnections in Wisconsin, excluding those operating at less than 20,000 volts, are as follows: Five at 132 kv., three at 110 kv., nine at 66 kv., one at 44 kv., eight at 33 kv., ten at 26.4 kv. and one at 22 kv. All provide for power interchange and transfer and for mutual emergency aid.

During 1935 Wisconsin utilities transferred 35 per cent of their total requirements, or 906,142,506 kw.-hr., among themselves and utilities in adjoining states. This transfer involved the use of 123 active interconnections, 100 of which involved flow in only one direction.

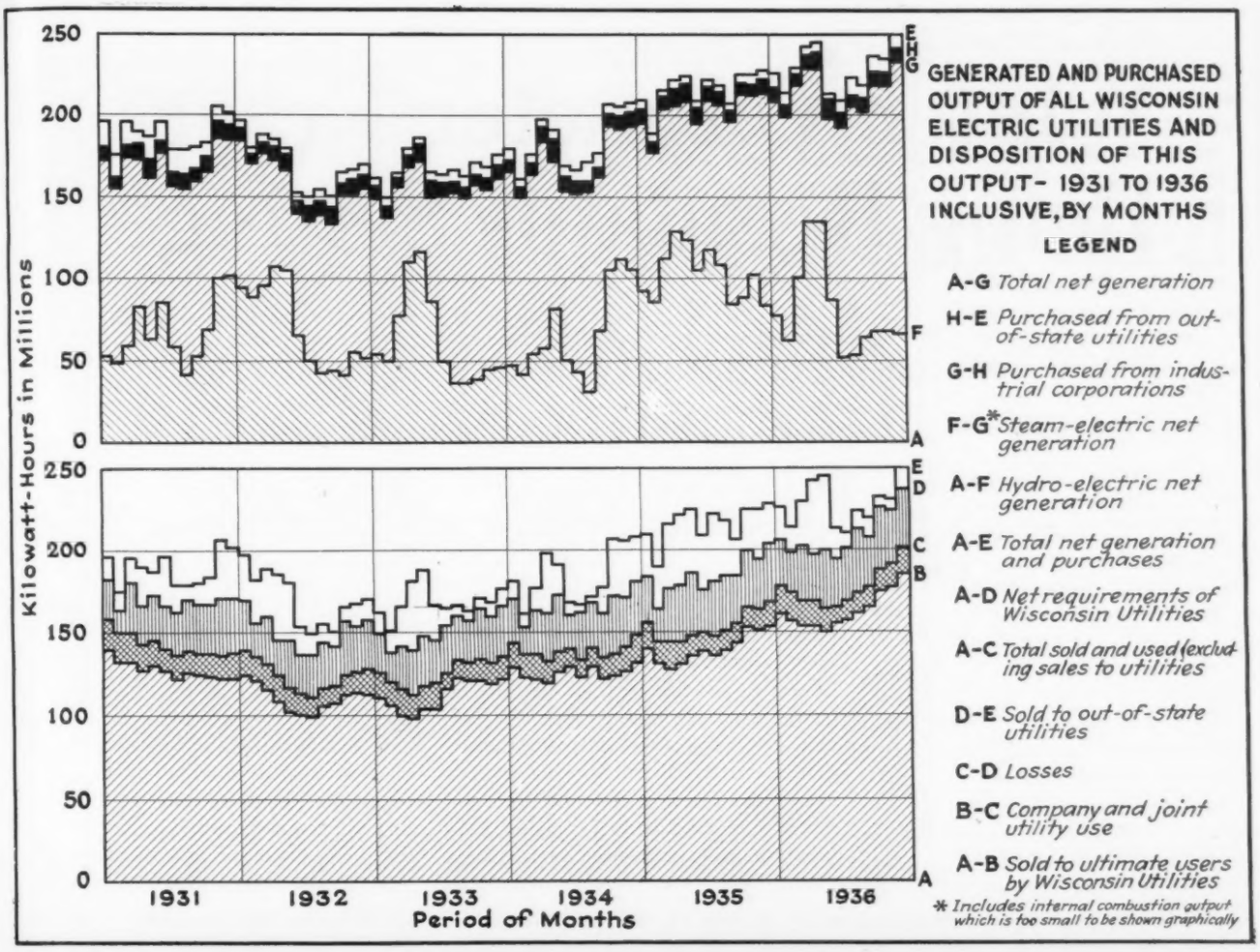
Most of the interconnections serve small systems dependent upon electric power from large, centrally located and efficient generating stations. As loads grow, it is probable that more interconnection will be found advisable.

Diversity small

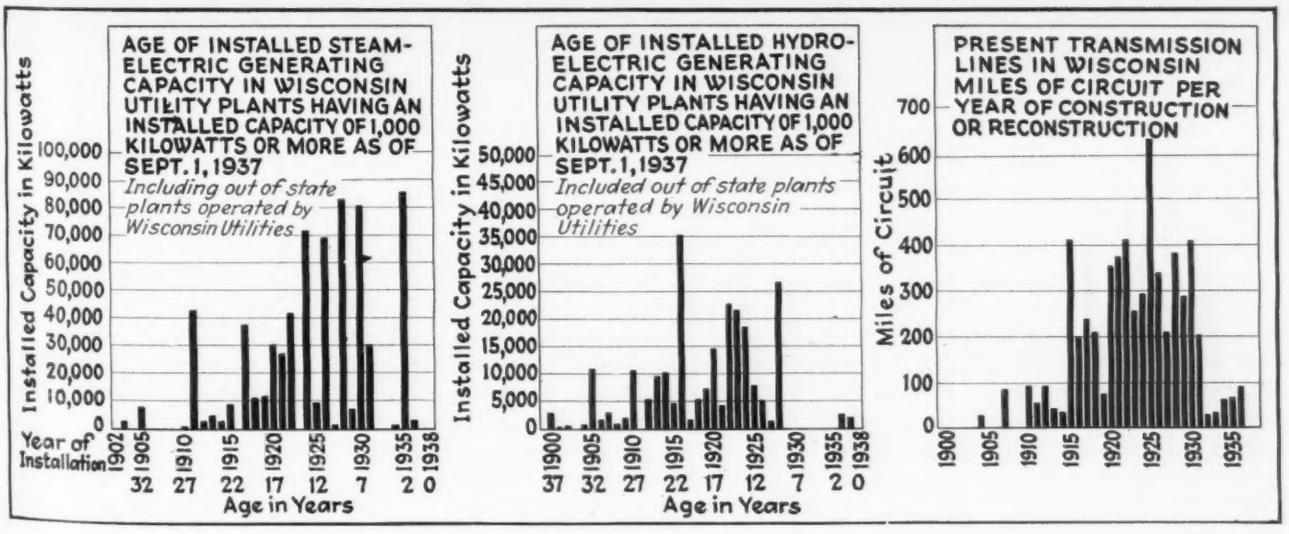
A study of the loads of ultimate users indicates a striking similarity in load characteristics on practically every system. There is only about 11,000 kw. of dependable diversity east of the Wisconsin River basin and 1,700 kw. on the other side. However, conditions such as shifting of loads will affect the diversity and make the findings of the report of general interest only. Diversity, while important in interconnections, does not alone guarantee that a contemplated interconnection is advisable, nor does its absence make the interconnection unattractive. Other factors are those enumerated at the start of this abstract.

A ten-year forecast indicates that the 1946 power requirements will be about double those of 1936. The maximum demand in 1936 was 585,000 kw., while it is predicted that in 1946 it will be 1,034,000 kw. Load factor is expected to improve annually approximately 0.7 per cent.

[*Continued on page 108*]


GENERATED AND PURCHASED OUTPUT OF ALL WISCONSIN ELECTRIC UTILITIES AND DISPOSITION OF THIS OUTPUT- 1931 TO 1936 INCLUSIVE, BY MONTHS
LEGEND
A-G Total net generation
H-E Purchased from out-of-state utilities
G-H Purchased from industrial corporations
F-G* Steam-electric net generation
A-F Hydro-electric net generation
A-E Total net generation and purchases
A-D Net requirements of Wisconsin Utilities
A-C Total sold and used (excluding sales to utilities
D-E Sold to out-of-state utilities
C-D Losses
B-C Company and joint utility use
A-B Sold to ultimate users by Wisconsin Utilities
* Includes internal combustion output which is too small to be shown graphically
Kilowatt-Hours in Millions
Period of Months
1931
1932
1933
1934
1935
1936

GROWTH OF TRANSMISSION SYSTEM IN WISCONSIN
Miles of Present Circuit in Existence
Year Constructed or Reconstructed
TEN-YEAR FORECAST OF GENERATION AND PURCHASES AND MAXIMUM DEMANDS OF WISCONSIN ELECTRIC UTILITIES
Maximum demands (Scale right)
Kilowatt-hours generated & purchased (Scale left)
Actual
Forecast
Millions of Kilowatt-Hours
Thousands of Kilowatts
Years
TEN-YEAR FORECAST OF MAXIMUM DEMANDS AND GENERATING CAPACITY REQUIRED BY WISCONSIN ELECTRIC UTILITIES
A = Total installed dependable capacity
B = Maximum demand
C = Estimate of total capacity required
D = Dependable capacity on basis of load carried in hydro-elec. plants on peak day-1936
Demand in Thousand Kilowatts
Years


AGE OF INSTALLED STEAM-ELECTRIC GENERATING CAPACITY IN WISCONSIN UTILITY PLANTS HAVING AN INSTALLED CAPACITY OF 1,000 KILOWATTS OR MORE AS OF SEPT. 1, 1937
Including out of state plants operated by Wisconsin Utilities
Installed Capacity in Kilowatts
Year of Installation
Age in Years
AGE OF INSTALLED HYDRO-ELECTRIC GENERATING CAPACITY IN WISCONSIN UTILITY PLANTS HAVING AN INSTALLED CAPACITY OF 1,000 KILOWATTS OR MORE AS OF SEPT. 1, 1937
Included out of state plants operated by Wisconsin Utilities
Installed Capacity in Kilowatts
Age in Years
PRESENT TRANSMISSION LINES IN WISCONSIN MILES OF CIRCUIT PER YEAR OF CONSTRUCTION OR RECONSTRUCTION
Miles of Circuit

Winter Voltmeter Errors Befog Regulator Settings

Winter Adjustments of Regulators Can Be Deceptive Unless Temperature Errors of Voltmeters Are Recognized or Averted

By RALPH A. BLOOMSBURG
New York Power & Light Corporation, Albany, N. Y.

UNRECOGNIZED, an error of 1 or 2 or even 3 per cent in setting voltage regulators during the Christmas week peak or any other customary period of early winter would leave the utility company secure in the belief that adequate voltage had been assured. But a little consideration of the limitations of the indicating voltmeters that are typically relied upon in this field activity might lead to sounder confidence in the moves to give the best service to customers.

With the prevailing increases in loading on residential and rural feeders it is essential to watch the upper voltage values at the beginning of a feeder and the lower values toward the end of the feeder. Early winter months usually reflect the peak conditions, and it is logical to pay considerable attention to the regulator settings and line drop compensation at that time. The results that are brought in may show that the voltage holds up surprisingly well on these winter peaks. Whether those reports are dependable hinges on the portable voltmeters used and their temperature errors under the extremes of temperature likely to be prevailing at that season of the year.

Self-heating recognized

The self-heating error of graphic voltmeters has been well recognized because it is easily detected, and much emphasis has been placed upon calibrating them in the field with the indicating voltmeters. But one is likely to consider that, for practical purposes, corrections for the indicating voltmeters are less than other sources of error. The more rugged types of portable indicating voltmeters are generally considered to have an accuracy of about $\pm\frac{3}{4}$ per cent. When we check them frequently against a standard meter we may feel that this is a liberal figure and that we can depend on the readings within $\frac{1}{2}$ volt at 120 volts. But it is not usually emphasized that the stated error is for only a moderate range in temperature and that the reading becomes higher than the true voltage, as the temperature drops, because of the decreased resistance of the copper part of the total resistance circuit. The generally recognized standard permits a change up to the rated accuracy of the meter for a 10 deg. C. change in temperature. When a temperature of 30 deg. C. and even 40 deg. C lower than normal room temperature is encountered a correspondingly increased shift is produced in one consistent direction.

The setting and checking of our distribution voltage is a field operation. The voltmeters used are exposed to ambient temperatures while being taken to the job. Some of the types have nearly 20 per cent of copper in the total resistance circuit, giving them a resistance shift of $\frac{3}{4}$ per cent for a 10 deg. C. change in temperature. Thus, an instrument that had been calibrated carefully at 70 deg. F. was placed in a refrigerator. At 27 deg. F. (not an unusual ambient temperature) the reading was 2 volts *higher* than the true voltage. At from 5 deg. F. to 10 deg. F. this error would make us believe that we had even three volts more than actually existed.

The problem is that this is a one-sided error that does not average itself out in any way. A systematic error of even one volt over a wide area in the heavy load months has an appreciable effect on service and sales.

It is important, therefore, to trace this factor through all of the phases of actual field work: (1) Setting the contact-making voltmeter level on the regulators in scattered substations; (2) checking the voltage on peak at the first customer and reducing the compensation accordingly; (3) calibrating the graphic charts on feeder surveys; (4) setting charts in customers' premises on complaints or checks. Yet, when the indicating voltmeter is brought into the meter laboratory for checking, it is almost invariably indoors for an hour or two and checks very closely with the standard at 70 deg. F. most likely prevailing.

Drift of voltmeters important

The contact-making voltmeters on outdoor regulators generally have substantially less drift than the indicating voltmeters, although some of the older types need consideration for wide ranges of ambient temperature because of the combination of resistance and mechanical shifts. The more important factors are that we may set the level with a voltmeter that has been transported to the job and adjust the compensation for what we think the first customer is getting, thus giving *every* customer on the line a voltage which is lower by the amount of the instrument error due to winter weather exposure.

Some types of portable voltmeters will, of course, have less drift than those cited, possibly 0.3 to 0.4 per cent for each 10 deg. C. But this still gives a shift of 1 to $1\frac{1}{2}$ volts at 30

[*Continued on page 114*]

Fuse-Breaker Correlation Fixed by Fault Ratio

Proportion of Temporary to Permanent Faults Determines Choice Between Reclosing Fuse and Reclosing Breaker

By P. E. BENNER

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General Electric Company,
Schenectady, N. Y.

WHATEVER value reclosing devices have in eliminating unnecessary outages depends on the probability that some of the faults are of a temporary nature. Obviously, if all faults were permanent there would be no advantage in automatic reclosing equipment. The fact that many overhead line faults are temporary is well known, as is likewise the effectiveness of reclosing breakers in counteracting the effects of faults on service continuity. But whether it be the reclosing fuse or reclosing breaker that is chosen as the automatically reclosing device depends on the proportion of temporary faults occurring on the circuit under consideration.

That the decrease in the number of outages resulting from the installation of a reclosing device depends on the number of automatic reclosures available and the proportion of temporary faults is demonstrated by the curves of Fig. 1, the derivation of which appears later. In general, the higher the proportion of temporary faults the greater should be the number of reclosures.

The curves of Fig. 1 are based on the premise that there is no inspection or replacement of blown fuses until an outage occurs. Unquestionably it would be possible to increase the effectiveness of a reclosing fuse or hand-reset device by frequent inspection and replacement of blown elements before an outage occurs. The more frequent the inspection the greater the improvement possible. It is even conceivable that with frequent enough inspection a two or three-element fuse might be made to approach a self-reset breaker in effectiveness. In any event an indication of the value of the inspection could be obtained by making a record of the number of fuse links replaced in a certain number of devices over a given period of time before an outage occurred. In this connection, however, it is important not to overlook the cost of inspection, which if capitalized might more than equal the added investment in a device making a large number of automatic reclosures.

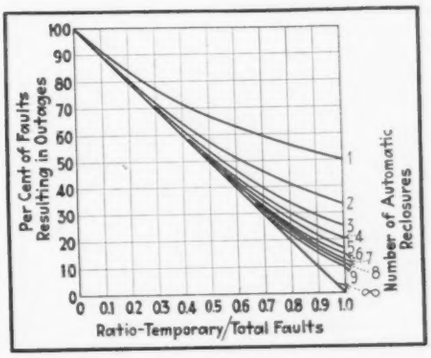


Fig. 1—The number of automatic reclosures has an effect on the percentage of faults resulting in outages

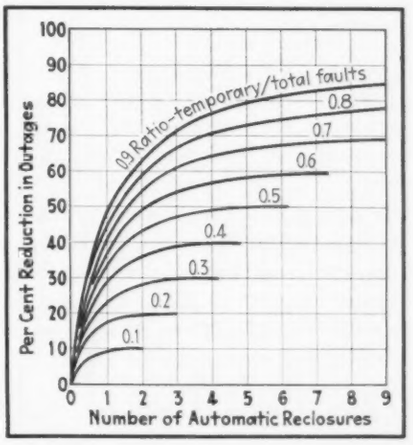


Fig. 2—The higher the proportion of temporary faults the greater the reduction of outages will probably result from using automatic reclosing devices

Distribution of faults

The curves in Fig. 1 also assume that over a given period of time there is no more likelihood of a temporary or permanent fault occurring at one time than another. Any tendency for permanent faults to occur at one time or season and temporary faults in another would tend to decrease the effectiveness of a device making a limited number of reclosures, or, stated in another way, it would require a greater number of reclosures to obtain the same effect. The following table, which covers the operation of a three-element reclosing fuse for a given period of time in which there are 50 permanent faults and 50 temporary faults, illustrates this point:

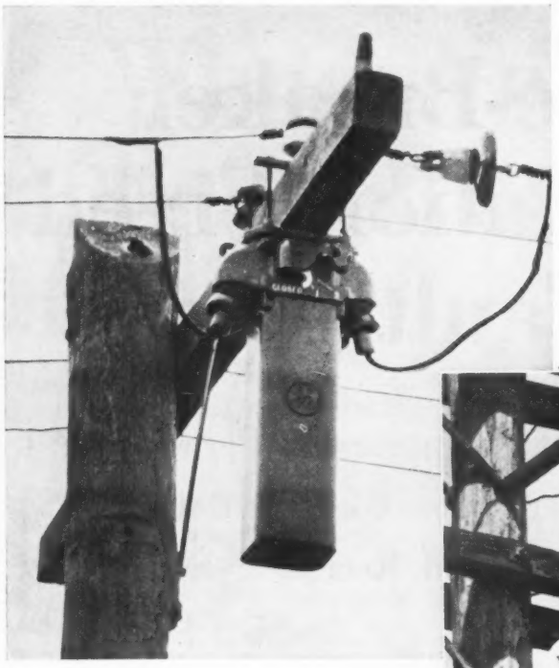


Fig. 3—Oil circuit recloser mounted under crossarm

Fig. 4—Lineman shunts cutout with jumper to replace door of indicating fuse cutout with reclosing door

	Temporary Faults	Permanent Faults	Outages
A 1st half...	25	25	28.6
2nd half..	25	25	28.6
	50	50	57 2
B 1st half ..	12½	37½	38.1
2nd half..	37½	12½	21.5
	50	50	59.6
C 1st half...	0	50	50
2nd half..	50	0	16.6
	50	50	66.6

The first alternative (A), in which there is an even distribution of faults for the first and last halves of the period of time under consideration, will produce 57.2 outages. The second and third alternatives show the effect of other distributions of faults which result in 59.6 and 66.6 outages respectively. By means of the curves in Fig. 1 it can be shown that under alternative B three reclosures would be required to approximate 57.2 outages and under alternative C six reclosures or, for all practical purposes, a self-resetting device, Fig. 3, would be required.

First reclosure produces greatest improvement

Further reference to the curve in Fig. 1 shows that the first reclosure produces the maximum improvement, which amounts to a minimum of three times the improvement of the second reclosure, six times the improvement of the third, etc. The relatively low cost of the two-element reclosing fuse (Fig. 4), together with the greater improvement obtained from the first reclosure as mentioned above, makes it possible to obtain at least twice the improvement per dollar invested for the two-element device as for others making a larger number of reclosures.

In comparing the operation of the various types of reclosing devices it is logical to study and analyze their performance from the results obtained; that is, in the reduction of outages resulting from their use. This information is given by the curves in Fig. 2, which show the percentage reduction to be expected for devices providing various numbers of reclosures. These curves not only provide a means for accurately predicting the outage reduction and service improvement but also make it easier to evaluate in dollars and cents attendant savings in maintenance expense, as obviously the elimination of an outage means saving a trip to replace a fuse.

To obtain the curves in Fig. 1 the theory of probability was used to evaluate the chance of a permanent fault occurring before or when the available number of reclosures are exhausted. This was accomplished by investigating the performance of the reclosing device for the various combinations of temporary and permanent faults, taking into account the probable frequency of occurrence of these various combinations. For a device making one reclosure, such as a two-element reclosing fuse, first consideration is given to the various possible combinations of two faults, which are:

Permanent—Permanent
Temporary—Temporary
Permanent—Temporary
Temporary—Permanent

The probable frequency of each of these combinations is equal to the product of the ratios of the type of fault involved. For instance, if 60 per cent of the faults are temporary and 40 per cent are permanent the relative probability of frequency of the temporary, permanent combination is:

$$(0.6) \times (0.4) = 0.24$$

The relative number of outages resulting from temporary and permanent faults is obtained by adding the relative number of temporary faults (T) resulting in outage to the relative number of permanent faults (P). The relative number of outages resulting from temporary faults is obtained by analyzing each of the combinations in the above tabulation as to expected frequency and probability that one or more of the temporary faults will cause an outage. Still considering a device making one reclosure, the permanent-permanent and the temporary - permanent combinations obviously result in no outages from temporary faults. The combination of two temporary faults in succession would cause only one outage, hence the expected frequency of outages from this combination equals $\frac{T\ T}{2}$

The permanent-temporary combination will cause an outage when followed by a temporary-permanent combination, but not if followed either by a permanent-permanent or a permanent - temporary combination. The temporary-temporary combination, of course, has no effect. The probability of the permanent-temporary combination causing an outage is therefore equal to:

$$\frac{(PT)}{(2)} \times \frac{(TP)}{(TP+PT+PP)}$$

The factor 2 appears in the de-

[*Continued on page 115*]

Industrial Transformers Made Fireproof

Air, Porcelain and Asbestos Free Industrial Plant Transformers of Fire, Explosion Hazard

By H. V. PUTMAN . . . W. W. SATTERLEE
Westinghouse Electric & Manufacturing Company, Sharon, Pa.

THERE is a demand today for transformers for industrial application that can be installed inside buildings without requiring the construction of vaults as a protection against fires or explosions. Is it possible to build a transformer that is actually fire-proof and really explosion-proof for this application? This article attempts an answer. It describes a transformer that is fire- and explosion-proof and points out its limitations.

The use of fire-proof dielectric liquids, such as Inerteen, in conventional transformers only partially solves the problem. No transformer in a sealed tank can be truly explosion-proof whether it is filled with Inerteen or any other non-combustible fluid.

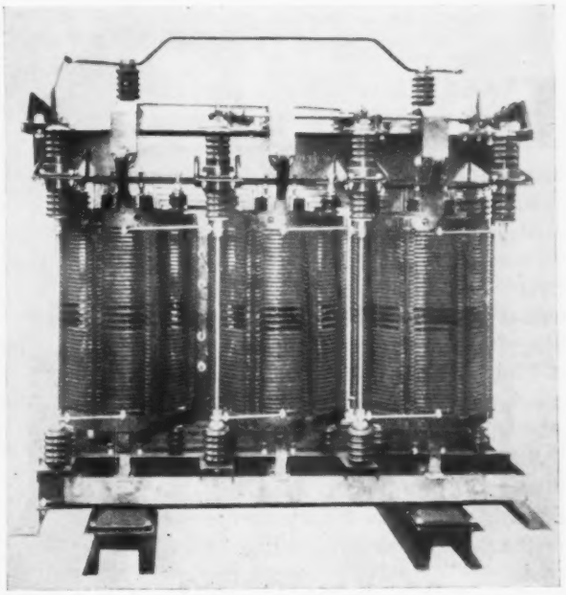
Regardless of the dielectric fluid, an internal short circuit of 12,000 to 15,000 amp. is bound to cause an explosion because of the enormous amount of gas generated almost instantly by the heat of the arc. Such an explosion cannot be confined to the tank. The gas would be liberated inside the building or vault, and gas from fire-proof oils, while non-combustible, is highly toxic. It should be said, however, in defense of fire-proof liquids, that external explosions have resulted from stewing arcs in ordinary transformer oil which have filled the vault with combustible gases that have subsequently exploded in the vault itself.

With fire-proof oil, the gas given off as a result of a stewing arc is not combustible and an explosion in the vault itself would be avoided. On the other hand, the gas given off is highly conducting and readily absorbed by the liquid. Therefore, the dielectric strength of the liquid itself would immediately drop. Consequently, it appears that a stewing arc would readily develop into a short circuit across the terminals inside the tank and then a primary explosion would occur, with the almost instantaneous liberation of large volumes of toxic gas.

The transformer herein described overcomes these undesirable characteristics.

Obviously, if a transformer is to be completely fire-proof and explosion-proof, it must not be confined inside a tight tank and it must contain no combustible insulating materials whatever. Reliable data indicate that up to 13,800 volts air alone can be used as the major insulating medium between windings without adversely affecting the electrical characteristics. It is also clear that even for transformers as large as 500 kva. no auxiliary air blast equipment is required for cooling. The Westinghouse Research Laboratories have made this type of design (Fig. 1) practicable by developing Class B insulating materials

[*Continued on page 116*]



This shows a 500-kva., three-phase transformer for transformation from 13,750 volts delta to 216 volts star. The skeleton windings are supported from the core and end frames by porcelain pillars, and radial porcelain insulators at the top and bottom separate the high- and low-voltage windings. Porcelain spacers are used between coils of the high-voltage winding. The low-voltage winding is helical in form, with porcelain spacers between the individual turns. The turn-insulation of the high-voltage coils is an especially treated asbestos developed by the Westinghouse Research Laboratories. In the processing of this insulation the coils are heated to a temperature of 350 deg. C.—higher than any temperature likely to occur in service even under the most abnormal conditions. In electrical characteristics the air-insulated transformer is not greatly different from the oil-insulated type. It withstands the same dielectric tests, has the same temperature rise limits and the same total losses. The ratio of copper loss to iron loss is, however, much less in the air-insulated unit—an advantage from the standpoint of short-time overload capacity.

Fig. 1—Turns and coils spaced by porcelain insulators in this air-cooled transformer

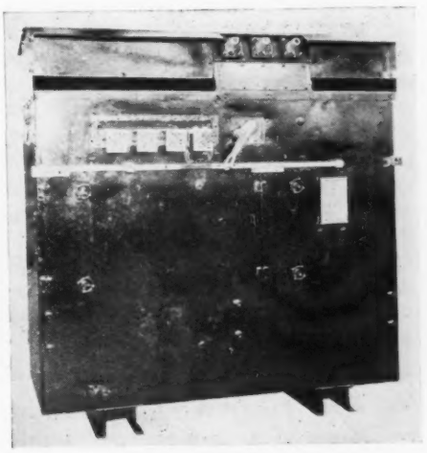


Fig. 2—Typical housing for 500-kva. air-cooled transformer

The House With the Golden Windows

Residential Lighting Load Building Merits Active Executive Support — Average Usage Is Up 75 Kw.-Hr. and Added Revenue Costs Are 51 Cents per Dollar

By H. W. COOPER

Vice-President in Charge of New Business, Wisconsin Power & Light Company, Madison, Wis.*

FAMILIAR to many is the fable of the little lad who, looking far to the west early every morning, saw a house that seemed to have golden windows. It attracted him strongly, so one morning he set out to visit this wonderful house. All day he trudged toward it, and just before sunset he arrived, but the windows no longer looked like gold.

"Where is the house with the golden windows?" he asked of the little girl who answered his knock.

"Why, don't you see? There is the house with the golden windows," she replied, and pointed back to the east to the very house from which he had come.

Every utility executive who is responsible for the condition of the balance sheet would be interested in a fabulous market that would increase his revenues. But many are willing to investigate only those which appear "far to the west" and promise very large blocks of load. Where such markets exist they are, of course, important and no opportunity to develop them should be overlooked. But as in the fable of the little boy, the "house with the golden windows" is right where we are, all around us, every day.

Home lighting offers a golden opportunity to the utility, its stockholders and its employees. Wherever the softly diffused golden glow of good quality light marks homes made happier and more comfortable by improved seeing conditions, there is the utility's "House with the Golden Windows."

The home-lighting problems of the Wisconsin Power & Light Company are those of a medium-sized utility rather thinly scattered over a widespread territory with a well-diversified but essentially agricultural background. Throughout some 15,000 square miles in southern and central Wisconsin, the company serves 71,000 residential customers plus 12,500 rural customers. On its lines there are only four cities of 20,000 to 40,000 population and no others as large as 10,000, while most of its several hundred so-called "urban communities" contain from 100 to 1,000 people. About nine-tenths of the rual customers are actual farmers.

Howard W. Cooper

Prior to his promotion two months ago to the executive vice-presidency of Central Power & Light Company of Corpus Christi, Texas, Mr. Cooper had been vice-president of Wisconsin Power & Light Company. After his graduation from Oregon State College, twenty years ago, Mr. Cooper served as business manager at various localities in the territory of the Pacific Power & Light Company. In 1933 he became division manager of the Washington Water Power Company at Lewiston, Idaho, and then joined Wisconsin Power & Light Company.

Until 1934 the company had no lighting department nor any one devoting full time to lighting work. Then the very pressing need for more revenue fostered the recognition of load building as a fundamental function of utility operation. Such recognition came through considering the activity in terms of the estimated annual revenue (E.A.R.) it would yield. When the results of lighting efforts were shown to be reflected down in the "southeast corner" of the balance sheet in the form of *net revenue* they attracted the favorable interest of the management.

But the measuring stick for any load-building activity or expense is cost to secure, per dollar of E.A.R. When experience proved that home-lighting load could be secured for a fraction of the first year's gross revenue executive *interest* crystallized into definite executive *support*. E.A.R. has become the common denominator in all load-building plans and a part of the employees' working vocabulary,

* Mr. Cooper is now executive vice-president Central Power & Light Company, Corpus Christi, Texas.

while cost per dollar of E.A.R. is the measure of effectiveness in actually adding to the net revenues of the company.

Several widely different methods have been co-ordinated and employed to increase the lighting load and revenue. This diversity of method is in itself a definite characteristic of the policy and program now in progress. Profitable results are not dependent upon a single type of activity, nor on any one group of people, nor on any temporary campaign. Home lighting has become an important part of the business of the whole company, is supported by employees of every class and is arousing the interest of independent dealers throughout the whole territory.

The Men With the Black Derbies—In conjunction with home economists, this crew sold 106 I.E.S. lamps in one month

Ten methods employed

By creating both momentum and prestige, the use of several activities makes each one more effective than it might be alone. And a co-ordinated attack upon the problem from several angles presents many types of appeal with but one objective. Except for a brief period in midsummer, the home-lighting program is continuous, but it is not allowed to become monotonous. By shifting the emphasis or by bringing different groups into the spotlight it is kept fresh and vital.

The other outstanding characteristic of the program is that all its parts have been fully tried and found successful elsewhere. Since the impelling motive of this whole effort has been the immediate and economical increase of revenue, no money has been risked in experiments with untried schemes. By adaptation and transposition of proved plans, practically any utility can construct a home-lighting program well fitted to its needs. Those which the Wisconsin Power & Light Company chose included:

1. Separate supervision by a well-qualified lighting man.
2. Use of home-lighting advisers.
3. Demonstrations before schools, P.T.A.s, women's clubs, etc.
4. All-employee Mazda bulb campaigns.
5. All-employee I.E.S. lamp campaigns.
6. I.E.S. Better Light-Better Sight selling crews.
7. Sales training for employees *and dealers.*
8. Gift lamps for babies.
9. Educational contests among customers.
10. Lamp shows and other co-operation with dealers.

All of these load-building methods contribute to the final results. While they vary in scope and in effectiveness, well-trained and enthusiastic people can make any and all of them successful.

To initiate this work an experienced man was engaged as lighting supervisor. He began with only one girl working as home-lighting adviser. After a training period, she was put in the field to test the idea and to develop the selling technique. As other girls were added to the force, all worked in one crew for a time. Then the supervisor assigned the girls to separate districts to carry out his policies under his general supervision, but with direct responsibility to the district manager. Both the group and the individual assignments work well if the *local supervision* is adequate and enthusiastic and both fail if it is not.

Soon the company adopted the crew method of demonstrating and selling I.E.S. lamps as described by W. F. Jordan of the Kansas Electric Power Company in the August 1, 1936, issue of ELECTRICAL WORLD. In this work a crew manager and two junior salesmen wearing black derbies, operating from a snow-white truck, and preceded by newspaper announcement and personal letters to the housewives, placed I.E.S. lamps in homes for demonstration and arranged appointments for three home-lighting advisers. The girls followed a few days later to tell the Better Light-Better Sight story and make constructive recommendations for better seeing conditions.

Regardless of the customer's reaction to the demonstration as expressed in purchasing, the home-lighting adviser always showed her appreciation of the opportunity to tell her story by giving the customer a 100-watt bulb. This was not merely left as a spare bulb, but was definitely put in service wherever the home conditions indicated it would do the most good. The effect of this work may be judged from a typical month's results as shown in the accompanying table.

I.E.S. Better Light-Better Sight Crew Results

One Month—Six People
December, 1936

I.E.S. Lamps sold	106
Wattage of above lamps	11,205
Additional wattage resulting from recommendations	16,995
Total wattage added	28,200
E.A.R. at $30 per kilowatt	$846.00
Total net cost to secure	$446.50
Cost per $ of E.A.R.	$ .53

While the work of home-lighting advisers builds profitable load, and at reasonable cost, it is obvious that the pace can be greatly speeded up by the combined efforts of all employees. For every employee, regardless of his rank or regular duties, has the opportunity to improve the appreciation and acceptance of good lighting by his friends and neighbors.

Increased wage incentive

To accelerate the Better Light-Better Sight program the co-operation of the whole rank and file of employees was secured. It so happened that the representative council of the

employee organization had pledged support of load-building activities to assist the company in regaining revenue with which to pay an increased wage scale for all employees. After the plans had been worked out with the employee representatives, therefore, meetings were held throughout the property in early spring of 1937 to enlist the interest of all employees in selling I.E.S. lamps and to give them the necessary information. For about every ten employees (or for smaller groups geographically isolated), employee "sponsors" were selected and given brief additional training. This co-operative activity is an outstanding and encouraging example of harmonious bargaining between the management and the employees.

The I.E.S. lamps chosen included one student model to sell at $2.19, one floor study lamp at $3.95 and one indirect portable with a 100-200-300-watt bulb at $5.95. This selection avoided competition with the dealers of the territory, giving them an entirely free hand in the higher-priced field where merchandising profit is greater. A cash commission of 50 cents was paid to employees for the sale of each study lamp and 75 cents for the "3-lite."

As in every other general company activity, the urge of keen but friendly rivalry was used to keep enthusiasm at a high pitch. Each district was in competition with all others. Each employee was classified into one of nine groups, where he competed with all other employees having about equal opportunity to sell lamps. Contrary to custom, this lamp campaign occurred in March, April and May when evenings were getting short and attention was turning to outdoor activities. Nevertheless, it proved to be a success in itself as well as an excellent preparation for a bigger drive in the fall.

Sixty-five per cent of all eligible employees were successful in selling I.E.S. lamps. They sold 10,464, which is equal to 12½ per cent of the company's rural and residential meters. At existing rates each study lamp is expected to yield $3 of E.A.R. and each 3-lite about $4.50 of E.A.R. The total will be more than $38,000. This is a remarkable employee performance, especially in view of the fact that the activity was staged at a season otherwise considered poor for I.E.S. lamp selling.

Demonstrations important

In spite of the range in prices, the lamps sold in the proportions of 22 per cent table study, 34 per cent floor study and 44 per cent 3-lite. Sample lamps were available to all employees for demonstration in their own homes or in the homes of prospects. These demonstrations proved to be the most effective selling method, the records showing that 80 per cent of all demonstrations resulted in sales. A notable example of this is the case of W. Castner, the operator of an isolated little hydro plant in the village of Rockton, with only 304 residential meters. By the enthusiastic presentation of the Better Light-Better Sight idea and through demonstrations of the I.E.S. lamps in his own home, with the help of his family, this man, without sales experience, was able to sell 168 lamps, equivalent to 55 per cent of all the meters in town. He added $550 to the residential revenue and well over $100 to his own earnings. The total commissions and prizes of the employees amounted to some $8,000.

The activity of the employees has been supplemented by co-operation with many independent dealers. In the small towns served there are scores who never see the extensive displays at buying centers such as the Merchandise Mart in Chicago. Since the dealers do not go to the lamp shows, the company has brought the lamp shows to them. In co-operation with eight manufacturers of I.E.S. lamps, it has staged three attractive displays in different sections of the territory. To these shows all dealers in surrounding towns have been cordially and personally invited.

At the shows the dealers have been able to choose their own stock of I.E.S. lamps from a wide selection and without duplicating those featured by the company or by other dealers in the same town. This particular feature of co-operation is probably unique, and it has certainly been effective in spreading an appreciation of what the market offers and in making approved I.E.S. lamps available to the public through many additional outlets.

Space will not permit a detailed description of each activity in the coordinated program, but the aggregate result of the varied attack is enlightening.

In 1935 home lighting E.A.R. totaled $7,522 and cost $0.94 per dollar of E.A.R.

In 1936 it amounted to $18,150 at 66 cents per dollar of E.A.R., and in 1937 for *the first half*, $44,960 of E.A.R. was reported, costing 51 cents per dollar of E.A.R.

[*Continued on page 117*]

Employee Representatives Make I.E.S. Plans—Campaign details are decided by this employee group

Shown in circle is William Castner, who sold 168 I.E.S. lamps to his 304 customers

Revenue 6.4% Over 1936

September earnings continue upward trend — Energy sales up 10 per cent — Industrial power droops slightly — Rates continue to decline

OPERATIONS of the electric light and power industry in September established new records for the month, while giving indications of the onset of the recession, which has since become increasingly evident. Revenue rose to $186,846,800, an increase of 6.4 per cent over the month a year ago, according to the Edison Electric Institute; output also rose 6.4 per cent to 9,753,904,000 kw.hr.

Both percentages are somewhat smaller than in other recent months. For example, June revenue was 8.9 per cent higher in 1937 than in 1936 and energy production was 12.4 per cent higher. At the same time revenue in September advanced seasonally $4,790,000 over August and the curve shows the usual rising trend from the low point in May.

Energy production was somewhat smaller in September than in August, but this was due in part to the smaller number of working days. Average daily production was approximately the same in both months. Water power contributed 30.3 per cent of the total output.

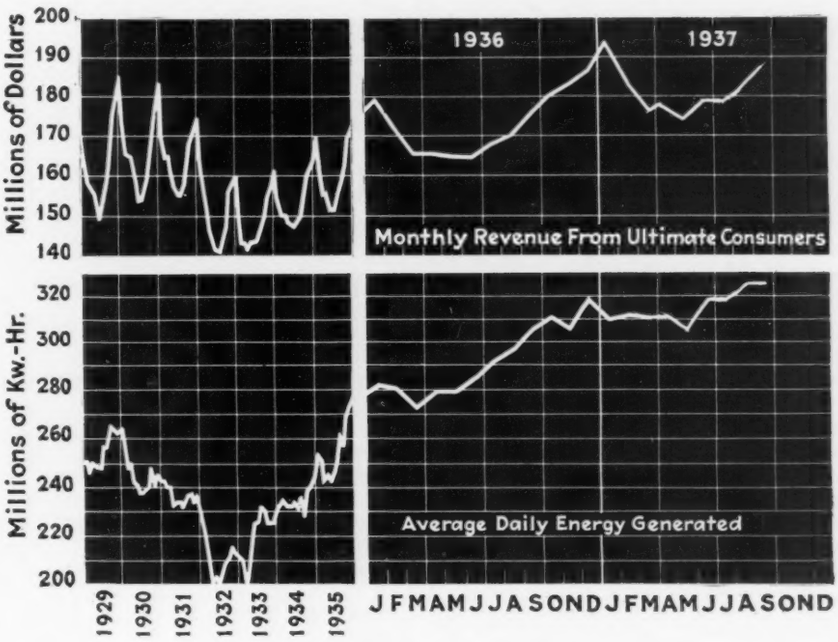


Table I—Monthly Revenue from Ultimate Consumers and Energy Output of the Electric Light and Power Industry

Compared with Corresponding Month of Previous Year

Month 1937	Revenue from Ultimate Consumers‡		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
September	186,847	+6.4	9,754	+ 6.4	2,947	+ 7.5	6,807	+ 5.9
August	182,057	+7.3	10,099	+10.2	3,028	+10.3	7,071	+10.3
July	179,637	+7.1	9,865	+ 9.1	3,160	+12.1	6,705	+ 7.8
June	178,539	+8.9	9,563	+12.4	3,491	+19.0	6,072	+ 9.0

* By courtesy of Federal Power Commission, with deductions for certain plants not considered electric light and power enterprises. ‡ Edison Electric Institute.

Table II—Allocation of Energy by Classes of Service, 1937

Compared with Corresponding Month of Previous Year (Edison Electric Institute)

Class of Service	September		August		July	
	Millions of Kw.-Hr.	Per Cent Inc.	Millions of Kw.-Hr.	Per Cent Inc.	Millions of Kw.-Hr.	Per Cent Inc.
Total for distribution*	9,983	+ 7.8	10,352	+11.6	10,113	+10.4
Lost in transmission, etc.	1,278	− 5.5	1,707	+ 9.9	1,657	+ 0.8
Sold to ultimate consumers	8,705	+10.0	8,645	+11.9	8,456	+12.5
Domestic	1,478	+17.2	1,382	+17.1	1,371	+18.2
Com'l, small light and power	1,586	+13.1	1,539	+13.1	1,497	+13.7
Com'l, large light and power	4,977	+ 9.6	5,071	+13.0	4,944	+13.4
Municipal street lighting	167	−14.9	154	−18.2	140	−18.1
Railways — street, interurban	326	− 3.7	326	− 4.0	333	− 2.8
Railroads — electrified steam	97	− 2.1	97	− 0.6	100	+ 1.7
Municipal and miscellaneous	74	+ 0.6	76	+ 7.4	71	+ 3.1

* Generated, purchased from other sources, imported, less energy used in railway and other departments.

Domestic rates fall, sales rise

The notable change in energy sales was the downward turn in the wholesale commercial group, largely industrial power, from 5,071,000,000 kw.-hr. in August to 4,977,000,000 kw.-hr. in September. The change was small, but it marked the first break in the steady rise since February. At that the sales were 9.6 per cent above those a year ago.

In contrast with this, strong gains continue in energy used for domestic service, which was 17.2 per cent over 1936. The percentage thus far this year has ranged between 13.6 in May and 18.2 in July. Retail commercial sales were up 13.1 per cent, following a range from 10.5 in May to 15.9 in February.

For the twelve-month period the average domestic rate decreased by 7.1 per cent compared with a year ago to 4.46 cents, the consumption increased 10.7 per cent to 785 kw.-hr. per customer and the average monthly bill increased 2.8 per cent to $2.92. An increase during the year of nearly 850,000 customers is indicated, the number as of September 30 being 26,783,273, compared with 25,937,755 at the same date in 1936.

Modern Transportation for

By HAROLD J. MARTIN
General Plant Division, Department of Water and Power, Los Angeles, Calif.

MAINTAINING the large underground electrical system of the Department of Water and Power of the City of Los Angeles has required the building of several special transportation and construction equipment units. In general terms, this underground system consists of 1,960 miles of ducts and 7,850 manholes and vaults. About 90 miles of 33-kv. cable and 1,575 miles of 4,800-volt cable are in service, as well as 2,580 distribution and street lighting transformers. The accompanying illustrations show how trucks and chassis have been designed to carry cranes, winches, pumps and tools for this job of heavy construction.

1 Service truck built on a six-wheel Ford chassis. The winch shaft was extended for the mounting of a niggerhead on each side of the truck. Cable pulling may be done by wire rope over the rear sheave or by hemp rope around the niggerheads. A ring is welded to the chassis frame under the door for a snatch block mounting in case pulling is to be done to the side.

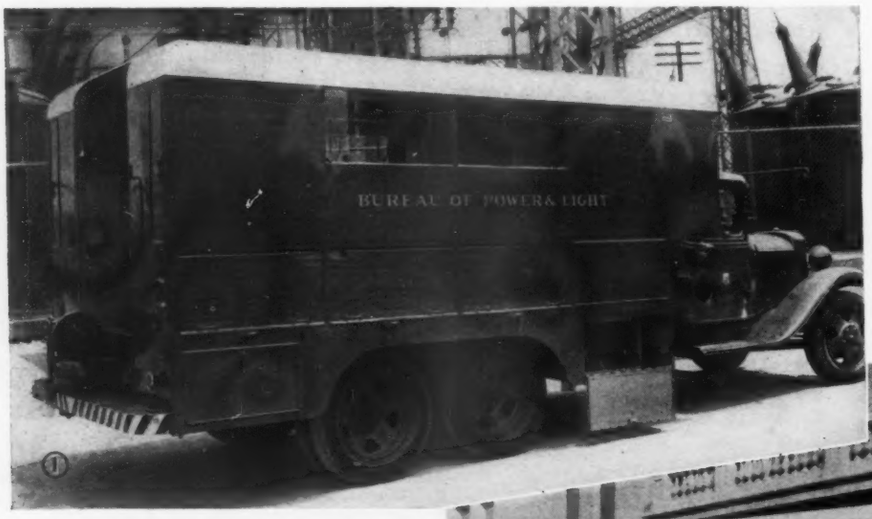
All the toolbins along the side have roll type doors except the forward one on the right-hand side, which drops down on chains to a horizontal position to form a writing desk.

Shelby tubing, the main members being 4 in. outside diameter, with ¼-in. thick walls. The crane may be raised or lowered from the position illustrated by means of pins through the base. The truck body ends just beyond the rear wheels so that the crane load is carried by the rear wheels, without raising the front wheels. A portion of the roof is removable, forming a slot for the wire rope from the winch, which is mounted just back of the cab.

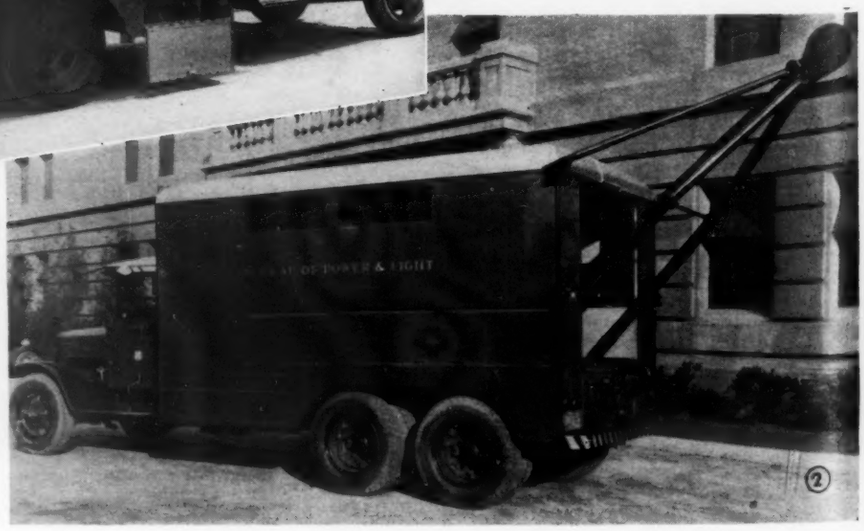
The winch ordinarily carries 900 ft. of ⅝-in. wire rope, but has extra large flanges for 200 ft. of 2-in. hemp rope, sometimes wound outside the wire rope. All controls for the winch are in the cab, the driver doing the operating as directed by buzzer signals. An extension cord drops into the manhole for the buzzer push button and automatically reels up when not in use.

The sheave above the rear bumper has a double groove to accommodate either the ⅝-in. wire rope or the 2-in. hemp rope. The sheave may travel laterally to align itself over the manhole without maneuvering the truck to the exact location. Most of the heavy pulling from the winch to the underground conduits is done over this sheave. When extra heavy pulls are required, jacks are set under the rear bumper to relieve the strain on the rear axles and tires.

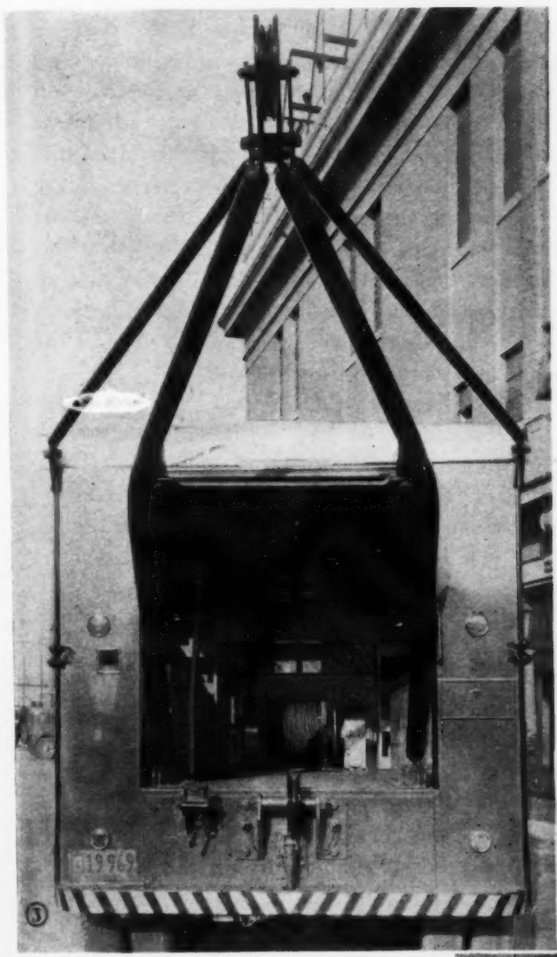
The trailer hook is used for pulling a large, two-wheel trailer which carries a reel of 33-kv. lead-sheathed cable weighing 15,000 lb. or less. The cable trailers are equipped with vacuum brakes.



2 Van type truck used by heavy gangs for installing 33-kv., lead-sheathed cable. The crane on the rear end was designed to withstand safely a pull of 20,000 lb. It is used principally for lifting heavy transformers from manholes and for pulling cable from conduit outlets up the side of power poles. The crane is fabricated of



Underground Construction

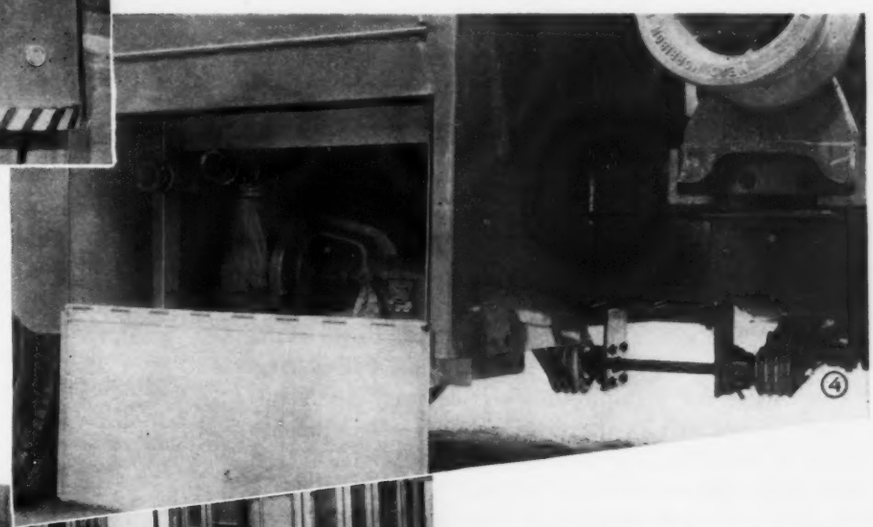


3 Ample space is available for storing tools and equipment. From this rear view it may be seen that the van type truck is a warehouse for carrying tools and supplies, tool bins being accessible through the roll type doors along the outside. Inside bins are used for storing meters, hardware, rubber goods, etc. The bin top on the right side is upholstered, forming a seat for the crew. The water jug is carried on the left with the faucet extending through the small square opening in the rear. Rope hooks are provided along the left side under the ceiling. Jointed rods for threading the conduit are carried in a crosswise bin just below the tool bins.

The roof is painted aluminum and insulated inside to keep out the heat.

A water pump is mounted on the right side in the same manner as illustrated on the service trucks.

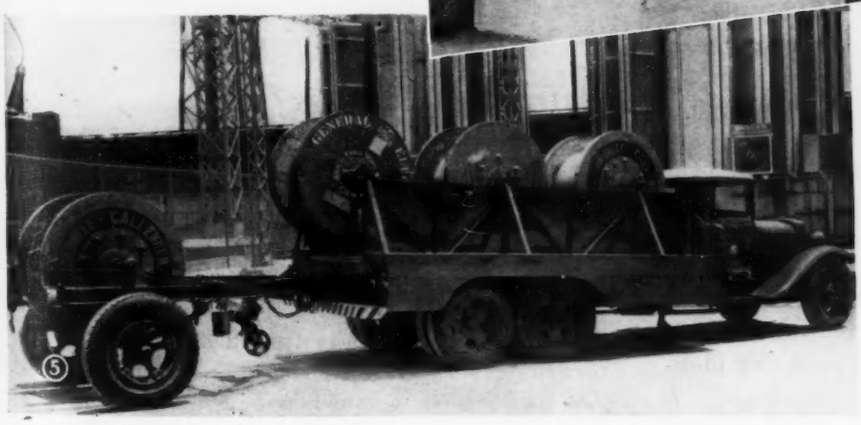
This body was built in the department's shops and installed on a truck that had already seen much service on the highway, but was in good shape for the comparatively short hauls required in underground cable installation. Crew sits on the right.



4 Self-priming pumps carried under each truck and used for drawing seepage from manholes. The pump is of the self-priming centrifugal type and is driven by V-belts from the same power take-off that is used to drive the winch. Sheet metal guards which ordinarily cover the V-belts and pulleys have been removed to reveal the construction. Two lengths of hose are carried and may be easily attached to the suction and exhaust hose nipples above the pump. The pump primes automatically in about a half minute and quickly pumps the seepage water out of the manhole.

Ladders are carried on each side above the toolbins, with doors opening to the rear.

Inside, above the toolbins, are the cabinets for meters and supplies. Hooks for ropes and coils of wire are visible through the safety glass windows. The crew sits on removable upholstered seats, set transversely across the center aisle.



5 Cable-reel truck body built on an old six-wheel Ford chassis. This type truck has proved very valuable where two or more underground cables are to be pulled at the same time as the truck may be backed up to the manhole and the cables reeled off to the rear. A much larger trailer than that illustrated is often carried behind the truck and vacuum connections are therefore provided for the trailer brakes.

The body is made of alloy steel, with a resultant saving in weight of about 600 lb. Although more expensive than ordinary structural steel, the saving in weight nearly made up the difference in first cost and will reduce the operating cost. The truck is also used for hauling fiber conduit, transformers and equipment.

Editorials

High-Pressure Plant Feedwater Problems

THE occurrence of the so-called caustic embrittlement in boilers some years ago has turned out to have been a fortunate event for engineers. This difficulty focused their attention on the necessity of a more complete knowledge of the action of boiler water and its dissolved substances upon the metal surfaces and of means for inhibiting or avoiding deleterious attacks. Research on this subject alone has extended over a long period and the complete story may not be known even today.

It is said that the rate of chemical attack doubles with each twenty degrees Fahrenheit increase in boiling temperatures, it is at once evident that the greatest higher boiler pressures, with resultant increased boiling temperatures, it is at once evident that the greatest care must be exercised to insure water that is free both from oxygen and from dissolved compounds that may break down or react with boiler metals.

Unfortunately, we do not know what occurs in water at these high pressures and temperatures. Free ions of oxygen and hydroxyl may exist under these conditions which lead to different results than at atmospheric pressure. The formation of protective coatings on the metal surfaces is also a problem to be considered and about which meager facts are available. Scale formation and its removal and prevention at high pressures must also receive careful study. The action of inhibitors, chemicals to maintain the proper Ph and the nature of the boiler structure itself for high-pressure service need much further study, both in the field and in research laboratories, before we can feel assured that engineers can prescribe proper feedwater control.

Some people hold that feedwater problems are receiving undue attention in America, since high pressures have been successfully used abroad. Reliable information indicates that neither the once-through nor the forced circulation boilers abroad have been wholly free from troubles and that caustic embrittlement and corrosion troubles are by no means infrequent.

The successful operation of new high-pressure American plants will depend in a large measure upon intelligent solution of these many and perplexing problems of feedwater control.

Emergency Reserve Demonstration

THE unprecedented action last week of the Pennsylvania Public Service Commission in ordering the Pennsylvania Power & Light Company to start up its Allentown reserve plant to meet a "theoretical breakdown of considerable magnitude" and deliver full capacity at the earliest possible moment merits the attention of other utilities that have retained old plants on the books as emergency reserve. The company was in the midst of giving testimony to justify the continuance of a lease for $350,000 a year for the generating plant of the Lehigh Valley Transit Company (an affiliate) when Commissioner Beamish ordered the company to demonstrate the ability of the plant to act as emergency reserve.

That the Allentown plant, except for an unfortunate bearing burnout on one machine, demonstrated its ability to carry loads in excess of rating is not the significant thing. What is important is that commissions lacking evidence of recent operation of an emergency plant under load might call for a demonstration of the plant's serviceability at a moment's notice.

Companies that keep old plants in reserve for emergencies may find it expensive to start them up at regular intervals and place them on the line for a while, but they also may find it greatly to their advantage in the long run. They are nothing but an expense until they are needed. These plants are very much like fire hose. They may appear to be all right, but there is nothing like a good work-out under actual load to find out.

If commissions are to take such action, companies can save themselves unfavorable publicity and bad public relations by conducting their own demonstrations without all of the confusion of an order. Then if trouble occurs it can be corrected without a blaze of unfavorable publicity.

A program of regular inspection and test operation under assumed emergency conditions might be desirable also as an added means of building public confidence in the company's operations.

•

A New Criterion for Refrigerator Sales?

FROM time to time we hear heads of operating companies express the opinion that their electric refrigerator sales are satisfactory because they equal the number of passenger automobile sales in the same territory.

A few facts released recently by *Business Week* may throw a different light on the situation. Dealing in percentages only (rather than units), the figures show that for the first nine months of 1937 passenger car

sales were 8 per cent above the comparable period in 1936, while refrigerator sales were up 15 per cent.

From the power company angle this would be fine were it not for the fact that the energy consumption of the electric refrigerator is declining steadily year by year due to continued improvement of the product. To offset the effects of this trend it is apparent that in certain sections of the country, notably the North Central, New England and West South Central, the self-imposed refrigeration sales quota of other years is being doubled.

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Good Service Reaps Its Reward

APPROXIMATELY 300,000 people entered the Electrical Standard of Living contest conducted by General Electric and completed the sentence "The Electrical Standard of Living Appeals to Me Because ———."

The utility man who views the stacks of replies and selects at random ten, a hundred or a thousand to read soon discovers three facts of importance to himself:

First of all, he will find that modern electric service is considered a priceless boon by these hundreds of thousands of U. S. citizens who wrote these letters—and wrote them within the last 90 days.

Secondly, he will be amazed to find that these hundreds of thousands say in so many words that electricity is their cheapest servant.

Thirdly, everybody seems to want to buy more electrical appliances!

It will be some days before anybody knows who won the big prizes, but to the quarter of a million people who day in and day out make the wheels of the public utility industry turn in their respective courses the letters as they stand are the biggest prizes.

Here is evidence at last that the millions of dollars spent in advertising by the companies and by the manufacturers, that the millions of trouble calls, of good customer contacts and the countless efforts to earn good public relations have amounted to something after all.

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Why Is Automotive Industry Absent?

SLOWLY but surely the need for adequate lighting along heavy traffic highways is making an impression on the public. More and more associations, such as the American Road Builders' Association, safety organizations, state and city highway traffic departments and the press are seeing the significance of the actual accident record under good and bad lighting conditions and are urging improved highway lighting.

Strangely enough, however, there is missing from the growing number of advocates of lighting for highway safety the one interest that we naturally would have expected to respond enthusiastically almost at once—the automotive industry. When measures for reducing driving accidents were discussed this fall by leading members of the automotive industry, highway lighting was conspicuous by its absence—so conspicuous, in fact, that it would almost seem to be deliberate.

It took a magazine article to arouse the public to the magnitude of the driving hazard. When the public as a result demanded that something be done about it, the automotive industry lent its support. Our job as an industry, therefore, is to continue to educate the public so that it in turn can demand safer night driving conditions.

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Be Not Deceived by Peak Load Voltage Surveys

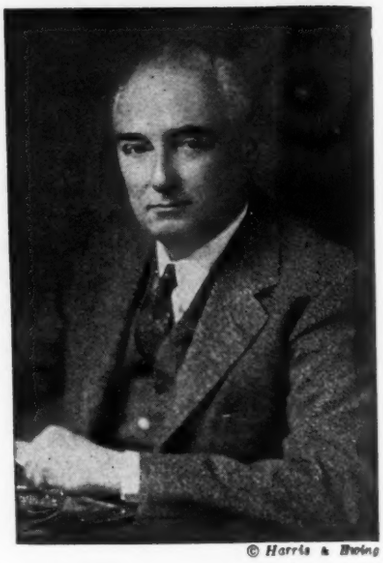
NEAR at hand is the season when voltage surveys are customarily made to insure customers having delivered to them the voltages that constitute good service for growing loads. If conditions are not up to standard, then adjustments of voltage regulators are made to get the best possible results for the whole distribution area. Beyond that it is a question of spending money for increased facilities. The advisability of making such expenditures is predicated upon the reliability of the voltage settings and checks. For that reason it is well to recognize a factor, that in many cases may have been overlooked, of too much complacent faith in the accuracy of voltmeters.

Voltmeters have temperature errors arising from their springs, their iron and their content of copper. From the difference in temperature between the laboratory where they are calibrated and the winter location where they are used in the survey the error can easily be of the order of 2 or even 3 volts for the types of instruments commonly adopted for the fairly hard usage to which they are subjected. What appears to be 117 volts may thus be only 114, and the winter error is always in this one direction. Such discrepancies may possibly account for the inconsistencies often encountered by those who analyze voltage survey reports.

As companies work closer and closer in efforts to improve border line situations it is logical to devote more and more attention to the accuracy of the data upon which the corrective activities and expenditures are based. One way out is to reverse the sign of the recognized error and apply it as a correction. This would be sufficient if the error were known with certainty. Since this is really the most important use for a voltmeter on a power system, the better way would be to use meters provided with temperature compensation.

If It Were Not for the Veto

By CARTER FIELD



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This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

ON CAPITOL HILL there are many senators and representatives who would like to see the electric industry given a chance. Probably a majority of both House and Senate believe, down in their hearts, that if the element of fear of government restrictions, of government competition, or possible exercise of an alleged right of eminent domain which would amount in effect to confiscation, could just be removed the whole business and unemployment picture would be much brighter. They believe that is what is stopping investors from spending the billion dollars a year, as government officials figure it, which the electric industry could profitably invest *if* there were an incentive for it to do so.

Senator after senator and representative after representative has told this writer in the last few weeks he would be perfectly willing to vote for certain things *if* there were any chance of getting them through. It is a frequent practice on Capitol Hill for men to vote for a thing they do not sincerely approve, because they think it would be good politics for them to do so, and *vice versa*.

But this so frequent motive is not what stands in the way of opening the door of opportunity to the electric industry this winter. That fact is proved by the general attitude of Congress on the tax situation. On that Congress frankly proposes to smash the whole idea behind the tax on undistributed corporation earnings, leaving probably a little face-saving remnant for the President out of deference to party regularity.

The motive actuating individual members of the House and Senate on this tax bill is precisely the same motive which makes so many of them willing to take the electric industry out of its straitjacket. Congress wants to provide capital with an incentive to invest, to provide corporations with the power to expand without paying a punitive tax for plowing back their earnings; in short, to encourage operations by private enterprise that will provide jobs and relieve the unemployment situation. And, incidentally, modify the blackness of that relief menace from the budget-balancing effort.

A careful canvass shows that Congress would never enact the public utility holding company death sentence were it to come up for a vote this winter. The same canvass shows that Congress would repeal or certainly modify drastically the death sentence were it brought to a vote this winter with any possibility of not running into a Presidential veto.

Just a little more doubtful, but still fairly sure, is the fact that Congress would go pretty far in providing that any use of a "yardstick" for electric rates should at least be a fair test, with honest estimates, honest appraisals of cost, fair allowances for taxes, etc.

But that veto possibility darkens the whole outlook, so far as the utilities are concerned. There is not the slightest intimation of any possibility of action to undo the things that have been done. The only hope of the utilities in Congress is the improbability that anything *new* will be done to them by affirmative action.

It is very simple to get a bill introduced. But to get action on it is difficult indeed. It requires a good deal of driving force by potent figures at both ends of the Capitol. It requires favorable committee action. In the House it frequently requires favorable action not only by the committee concerned but also by the rules committee. And favorable action by one House is not enough. Unless the other also acts, and unless any differences between the two can be adjusted and the measure then approved by both houses, the whole move becomes merely a gesture.

Which brings us back to the President's attitude. It is almost unthinkable that enough potent figures in the House and Senate would apply enough energy to accomplish passage of such a repeal bill in the face of their own conviction that the President would veto it. They would regard it as a thankless job. For few are optimistic enough to believe that they could muster the necessary over-riding majority.

Technically, of course, a repeal could be attached to some other bill. Readers may remember the Miller-Tydings bill was attached as a rider to the District of Columbia appropriations bill and thus passed, though the President had publicly denounced it. But it might be worth remembering that Jimmy Roosevelt was lobbying *for* the Miller-Tydings bill, so that a great many senators and representatives doubted the sincerity of the President's opposition. And when he signed the double-barreled measure they felt justified.

So it would seem that the most the electric industry can hope for from Congress is that it will not do anything *new* to hurt it. And that it will help the industry, along with other business, on taxes.

Unless, of course, the President should really soften his heart toward the utilities!

News OF THE WEEK

PWA Allotments for Power Plants Attacked In Supreme Court Cases

Loans and grants to municipalities for electric facilities in competition with utilities charged as unconstitutional by two power concerns — Buzzard Roost hydro-project suits aired for second time

With arguments concluded before the Supreme Court in the suits brought by Alabama Power and Duke Power against PWA loans and grants to municipalities for power plants in competition with existing utility facilities, prospects are that a decision will be handed down shortly after the first of the year.

Last week, for the second time, the nation's highest tribunal heard the Buzzard Roost power project aired in all its ramifications. Duke Power counsel related allegations that PWA, in allotting $2,852,000 to Greenwood County, S. C., for the project, tied a string to the contract by stipulating an arbitrary low rate for electricity. This procedure, Duke Power contended, would, in effect, force it to either meet the competition or run the risk of competition and loss of its business.

Charge delegation of power

The expenditure of funds for competition with private industry was attacked as an unconstitutional delegation of legislative power by Congress to the President. Also that if the national standard provided by Congress had been followed the expenditure would not have been made, for the Buzzard Roost project will provide but little employment.

When the Buzzard Roost case first reached the Supreme Court it was found that the suit had been rushed through the lower courts improperly and was therefore returned.

Alabama Power brought suit against PWA for making loans and grants to four municipalities for construction of power facilities. The utility argued that it would suffer injury by the competition. It was contended that the way in which these loans and grants were made was an unwarranted delegation of Congressional power.

With more than fifty PWA loan and grant power projects held up as a result of litigation the decisions in the Duke and Alabama cases, testing the constitutionality of the allotments, are expected to have a great bearing on the future course of the Administration's power program.

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Agreement Settles Alabama Rural Row

Disagreement between the Cherokee County Electric Membership Corporation, an REA co-operative, and the Alabama Power Company, which resulted in the filing of two suits in the District of Columbia court in an attempt to enjoin the transmission of REA funds, has been adjusted by negotiation resulting in an agreement between the co-operative and the power company to divide the territory. One of the suits has already been withdrawn and similar action is expected in respect to the other.

The difficulty arose when the power company charged that the co-operative intended to construct lines paralleling its existing wires. In defense, the co-operative charged that these lines were "spite lines," built after the formation of the new organization had been started in an attempt to block the co-operative project, which will purchase wholesale power from TVA. As finally settled, the co-operative agreed not to build 40 miles of projected line to which the company objected, while the company waived its protest against 91 miles of the co-operative project.

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Roosevelt to Resume Parley With Utilities

President Roosevelt has directed one of his secretaries, Marvin H. McIntyre, to make arrangements for conferences with one or two public utility representatives for next week.

So far the President has held conferences with Wendell L. Willkie, president of Commonwealth & Southern, and with Floyd L. Carlisle, chairman of Consolidated Edison Company of New York, Inc., and Niagara Hudson Power Corporation. No indications were given as to who will be the utility representatives at the President's conferences next week.

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West Virginia Power Asks Court Review Power Project

The West Virginia Power Company recently asked the U. S. Supreme Court to review its challenge of the authority of the federal government to condemn lands for the Bluestone reservoir, a $13,000,000 multi-purpose project on the New River in West Virginia.

A district court decision upholding the company's contention that land condemnation by the government is illegal was reversed by the Circuit Court of Appeals.

Electric Bond & Share Asks Court to Review Decision on Utility Act

Petition to nation's highest tribunal charges registration provisions violate Constitution — Declares ordinary civil rights are deprived by act — Utilities are appealing decisions of lower courts

Another step toward final determination of the constitutionality of the Public Utility Act of 1935 was taken this week when Electric Bond & Share Company and twenty-six affiliates asked the Supreme Court to review the decision of the Circuit Court of Appeals which upheld the validity of the act.

The "hand-picked" test case, brought by the Securities and Exchange Commission against the utilities in the Electric Bond & Share group, had been argued before Federal Judge Julian W. Mack in New York in November, 1936. Recently the Circuit Court upheld the decision of Judge Mack which declared the registration provisions of the act constitutional.

Sought ruling on act

From the start the utilities attempted to have the court rule on the constitutionality of the act in its entirety, but the government confined its case to the registration provisions.

The petition presented to the Supreme Court this week directed the attack upon sections of the act providing for the registration of all holding companies with the SEC. It was charged that the section violated several provisions of the Constitution.

It was charged that the penalty provisions of the act, providing for injunctions and barring of the mails against companies failing to register, deprived the utilities of "ordinary civil rights" guaranteed by the Constitution. The petition charged that the act constituted "an unconstitutional delegation of legislative power" through authority delegated to SEC.

One of the questions which the utilities said was presented by the lower court's decision was whether or not holding companies may be enjoined from engaging in interstate commerce in the performance of their normal business activities and from owning securities in subsidiary companies carrying on like activities unless they register with the SEC.

The utilities charged that the utility act was unconstitutional because it sought to regulate intrastate as well as interstate corporations. This action, it was said, resulted because no exemptions were provided for subsidiary companies operating in only one state.

The provisions of the act calling for simplification of corporate structures and the elimination of unnecessary holding companies go into effect the first of the year. The act calls for geographical integrated properties as the test for survival of holding companies under the so-called "death sentence" clause. So far no indications have been given by the SEC as to what steps will be taken to put these provisions into effect. The utility industry had sought to have a test of the constitutionality of the whole act before the "death sentence" provision became operative.

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Power Contract Row in Canada Ended

Dr. T. H. Hogg, chairman of the Ontario Hydro-Electric Power Commission, has announced that a new contract for delivery of power to the commission had been signed with the Beauharnois Light, Heat & Power Company. The contract, to run until 1943, calls for delivery of 260,000 hp. at $12.50 a horsepower.

The contract follows one cancelled by legislative enactment in 1935. Dr. Hogg said that all claims by Beauharnois were "wiped out" and that the parties to the agreement would "start afresh." The contract calls for immediate delivery of 125,000 hp., 25,000 deliverable November 1, 1938; no delivery in 1939 and 1940; 50,000 in 1941; 35,000 in 1942 and 25,000 in 1943.

Signing of the agreement brings to an end a $382,500,000 court and legislative battle between the Ontario Government and four power companies in Quebec: Beauharnois, Ottawa Valley Power Company, Gatineau Power Company and Maclaren-Quebec Power Company. Deliveries began in 1928 and to October 1, 1935 the commission paid $33,652,000 under forty-year contracts. In 1935 the Ontario Legislature declared the contracts "illegal, void and unenforceable." Revised agreements now have been made with all the companies.

Steam power for generating electricity "for certain special purposes" may take its place in the resources of the Ontario Hydro "in the not too distant future," Dr. Hogg said at a banquet given recently in his honor. Failure to anticipate future power demand and provide for it, Dr. Hogg said, "may have much more serious consequences than an error in the reverse direction (having too much power), especially as the cost of reserve power is comparatively little owing to the ready market for it on an at-will basis."

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Tennessee Agencies Confer on Rural Power Extension

Plans for co-operation between state governmental agencies in extending rural electrification projects throughout Tennessee were formulated at a recent conference attended by Governor Browning, members of the State Rural Electrification Authority and Railroad and Public Utilities Commission representatives.

A survey of electrical service needs of rural communities is now being conducted by engineers of the commission, Chairman Porter Dunlap informed the conference, and results of the investigation will be completed early in January.

Governor Browning said: "We are going to try to promote the organization of co-operatives in every section in which there is a chance of promoting TVA development."

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Consolidated Edison Workers Save $200,000 for Christmas

Employees of Consolidated Edison Company of New York, Inc., and its affiliated companies this year saved $325,000 in a special Christmas and vacation club operated by the New York Edison Savings and Loan Association, according to a recent announcement.

After withdrawal of funds for vacations during summer months, 2,200 members of the association had $200,000 available for Christmas

spending, an increase of 74 per cent in money saved and of 35 per cent in number of employees concerned over last year.

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Holyoke Water Power Adds Station Units

Holyoke Water Power Company has recently added a new 12,500-kw. General Electric turbo-generator to its plant. The development includes a top turbine of about 5,000 kw. soon to be purchased and a comprehensive system of steam supply to local industries, which is now in initial operation.

The latest boiler installation is featured by double fan automatic control in addition to usual automatic governing of oil fuel supply, draft and steam pressure. A 250,000-lb.-per-hour Riley boiler delivers 900-lb. steam at 750 deg. F. Smoot control brings one pair to Sturtevant forced- and induced-draft fans into service when the steam demand reaches about 40,000 lb. per hour, natural draft functioning at lower loads. At demands approximating 110,000 lb. per hour a second pair of fans starts work.

The arrangement, it is said, is highly flexible for quick-load pick-ups on this combined hydro-steam system. Arthur L. Nelson, engineers, are consultants.

Plans of Pacific Gas & Electric to Develop Feather River Opposed

Federal Power Commission regional director asserts that if hydro projects are constructed utility will be unable to accept more than one-tenth of output of government Central Valley development

Efforts to block development by the Pacific Gas & Electric Company of the Feather River for hydro-electric power will be continued when the Federal Power Commission resumes hearings early next year in San Francisco.

Opposition to the proposed six plants, with an aggregate installed capacity of 368,000 kva., is based on the fact that development of the potential power of that section of the river will be complete, thus placing the utility in a position as not dependent upon power from the Central Valley development of the Bureau of Reclamation.

Plan project in stages

E. A. Kramer, regional director for the power commission in San Francisco, testified at the recent hearing in Washington that if the utility constructs only the first two of the proposed projects, and 1942 is an average water year, it would be able to absorb only a tenth of the output of the federal Central Valley project.

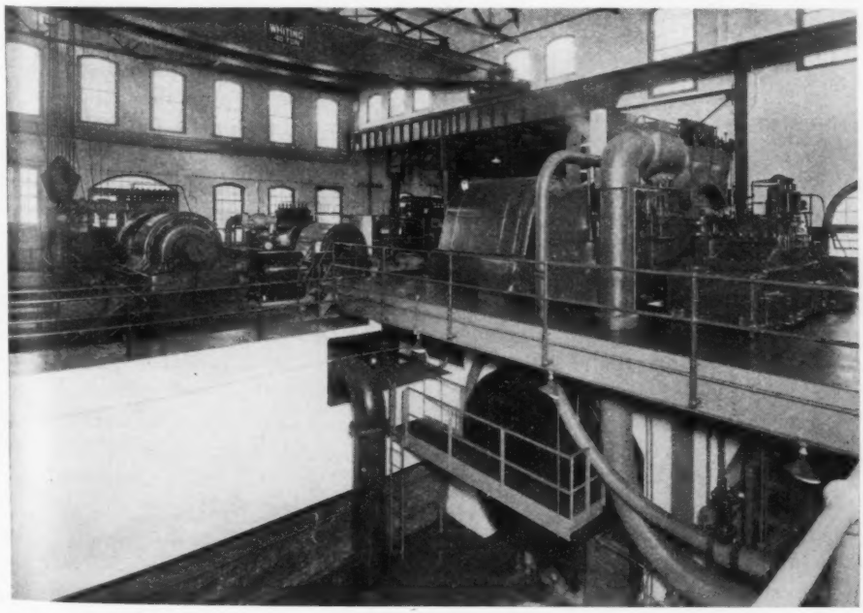
It was pointed out by Mr. Kramer that Pacific Gas & Electric plans to construct its hydro projects in stages, the first two being contemplated at present. By 1942, when Central Valley power is expected to be available, he said, the utility will then have excess capacity and be unable to accept more than one-tenth of the Central Valley output.

P. M. Downing and A. H. Markwart, vice-presidents of the utility, in presenting the company's case before the commission, stated that the demand upon the company system has increased each year since 1932 and has now reached a point where additional generating capacity must be provided. This situation exists despite an agreement with the Southern California Edison Company permitting a demand of 75,000 kw.

Development is economical

The chain of six power projects will be constructed by stages as the company's market for power increases. Study of all available power sources, it was said, including construction of steam plants, indicates that the Feather River development is the most economical. The plants are considered necessary because of inability to forecast with any degree of certainty when power from Central Valley will be available.

Mr. Kramer has estimated that Pacific Gas & Electric could make a probable saving of $750,000 by constructing the Pulga and Cresta plants as against steam-operated plants.



KILOWATT-HOUR MAKER—New 12,500-kw. General Electric turbo-generator recently added to the Holyoke Water Power Company plant. A 250,000-lb. per hour Riley boiler was also installed. Arthur L. Nelson, engineers, Boston, are consultants

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Illinois-Iowa Power Contract

An offer of the Illinois-Iowa Power Company to settle for $15,609 a five-year electric bill for street lighting totaling $23,298 has been accepted by the Venice, Ill., City Council, along with a ten-year contract for domestic power at a rate reduction of 30 per cent. New contract gives city right to tax company power line poles prohibited in the former contract.

FPC States Position Regarding Mergers

Denying the joint application for transfer of the facilities of Inland Power & Light Company in Oregon and Washington to the Pacific Power & Light Company, the Federal Power Commission, in an opinion made public last week, maintained that the Federal Power Act is not intended to require the merger of two operating companies merely because they operate within the same territory and each supplements the activities of the other.

"It is not always true that the larger the operating company, the more amenable it is to regulation or the more efficient in operation," the statement said. "It is not shown that the proposed transfer will tend toward the economical and more efficient development of an integrated public utility system, the ultimate end and aim of which is to improve service or reduce rates to the consuming public."

The commission stated that in reviewing the provisions of the Public Utility Holding Company Act of 1935 it finds no indication that Congress intended to require the merger of operating companies merely to increase their size or to effectuate a complete monopoly within a given territory where no benefit to the public can be shown to result from such merger.

"The consolidation or merger of horizontal operating public utilities is not necessarily a 'simplification of corporate structure' within the meaning of the Public Utility Holding Company Act of 1935," the opinion continued. "The simplification of corporate structure which is sought to be promoted by that act is the elimination of one or more companies of a vertical structure which operate no facilities and serve no interest of the consumer or the public at large."

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Court Restrains Commission Order on Power Line Refund

An order restraining the Public Service Commission from enforcing its order against the South Carolina Electric & Gas Company, relative to refunds for a power line erected to a ginnery at Rowesville, S. C., has been served on the commission. It was issued by Judge W. H. Grimball of Charleston. Fairey Brothers & Smith's ginnery at Rowesville wanted electric power to operate the gin and, according to the commission, advanced the money to extend the line. After the gin had been operating one season the commission held a hearing and ordered the utility to reimburse the customers for the cost of the line.

The order of Judge Grimball holds up the enforcement of the order of the commission until a court hearing is held.

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Home Lighting Plan Starts in Charlotte

A Christmas outdoor decorative lighting contest, with $200 in prizes, has been undertaken by the Charlotte, N. C., Chamber of Commerce and the Charlotte Park and Recreation Commission with the Duke Power Company co-operating.

In order to create city-wide interest, merchants, the P.T.A., luncheon clubs, radio, newspapers and boy scout units have been enlisted. The fire stations and the city hall will be decorated as leaders to the movement.

Contest blanks have been sent and can be secured on counters of merchants. The blanks must be mailed by 5 p. m. on December 23. Light should be turned on December 20 and burned each night thereafter until January 1. There is a city-wide prize of $50 for first and $25 for second. There will be a first prize of $10 and a second of $5, in addition to seven other cash prizes in each district.

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Investigate Rates of Fifth New York Municipal Plant

New York's Public Service Commission has instituted an investigation of the rates charged for electricity by the municipal electric plant of the village of Macedon, Wayne County. A hearing on the investigation has been set for January 13, 1938.

Some time ago the commission advised many municipal plants in New York State to reduce their rates, as it was believed they were excessive. A number of plants did so and so avoided rate proceedings. Commission has instituted rate proceedings against the plants at Groton, Tupper Lake, Hamilton and Endicott, some of which are still pending.

Prize Contest Closed by General Electric

In another week two among the one hundred weekly top winners of the General Electric Company "Electrical Way of Living" contest will be jubilating over the wonders of the Christmas season, for they will be announced as the winners of the two grand prizes, a $12,000 and an $8,000 home.

During last August and September General Electric interested 365 electric service companies, representing 75 per cent of the residential electric meters of the country and more than 90 per cent of the best potential prospects, in distributing more than 14,000,000 copies of a folder telling about the new American better living activity. It was a story of the electrical way of living.

To create interest General Electric provided two grand prizes and ten prizes of $200 of General Electric appliances each week for ten weeks for the best letters written on why "the electrical way of living appeals to me." This activity was widely advertised and promoted, with the result that so far it is known that 275,416 entrants, with the total not yet completed, entered the contest, which began September 27 and closed December 4.

From among the hundred weekly contest winners the judges will pick the two outstanding letters as winners of the $12,000 and $8,000 homes. The judges include Howard Ehrlich, executive vice-president of McGraw-Hill Publishing Company; Charles W. Kellogg, president of the Edison Electric Institute; Faith Baldwin, Eloise Davidson, director of the New York Herald Tribune Institute, and Mrs. J. Andrew Noe, president of the New York City Federation of Women Clubs.

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New "Stand-by" Equipment

Tide Water Power Company is to install $70,000 of new "stand-by" or emergency equipment to prevent a repetition of a recent interruption in electric power service, according to Mayor Thomas E. Cooper of Wilmington, N. C. Recently the electric service was interrupted from half an hour to four hours in various sections of the city when the hydro-electric company's system was severed in the vicinity of Lumberton.

Theoretical Service Break Test Met by Pennsylvania Utility Unit

Unprecedented action by Commissioner Beamish orders emergency reserve station of Pennsylvania Power & Light be put into operation — Company forces put on two twelve-hour shifts

In meeting a "theoretical breakdown of considerable magnitude" or an actual emergency in keeping the public in the "abundant life" of electricity is all in a day's stride of utility employees, as successfully demonstrated recently in the situation at the Allentown reserve plant of Pennsylvania Power & Light Company.

During testimony to justify continuing a lease for $350,000 a year from the Lehigh Valley Transit Company, an affiliate, of the Allentown steam and electric generating station, along with 66,000- and 11,000-volt substations and lines of the transit company supplying Allentown, Bethlehem and other nearby towns in the Lehigh Valley, an unprecendented call for action was put into force.

Orders "test" run

Public Service Commissioner Richard J. Beamish, who was hearing the case, was not convinced that the plant could be operated as testified, so set off the fireworks by ordering a "test" run on the plant.

In the unprecedented action Commissioner Beamish sent one of the commission's legal staff, with a written order to J. S. Wise, Jr., president of the utility, that a "theoretical breakdown of considerable magnitude" had occurred immediately upon receipt of the order, which breakdown "requires that the plant in question shall deliver its full energy capacity at the earliest possible moment."

The order was delivered to Mr. Wise at 3:45 p.m. December 6, at which time it was later disclosed representatives from the engineering department of the commission had already arrived at the plant to record every subsequent event.

Vice-president and General Manager N. G. Reinicker and his operating staff quickly set to work to put the Allentown plant into operation to meet the "theoretical breakdown," which "theoretically" had thrown the surrounding towns into darkness. Elevator operators, service men and janitors working in the company's 22-story Allentown office building, who had one time worked in the plant, were quickly corralled, along with construction and maintenance men from other parts of the company's system.

At the time the order was received one boiler with 65-lb. pressure was connected only to the building heating system. The others were laid up open with the customary boxes of lime in the drum. The generating plant, with a capacity in four machines of 36,000 kw. maximum, has been held as a cold reserve for more than eight years and only operated since on two emergency occasions, one being the flood of March, 1936, when more than 92,000 kw. in other stations of the utility were under water. At this time the Allentown plant was only needed for 10,000 kw.

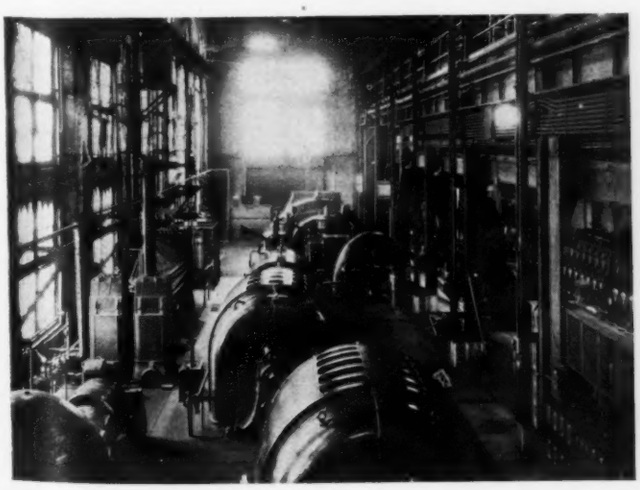
To get the entire station into full operation on such short notice, even on a "theoretical breakdown," was a job to test the mettle of any utility crew. By 10:45 p.m. the 12,500-kw. generator was synchronized, to be followed by a 4,000-kw. machine one hour and twenty minutes later. The third machine, 4,000 kw., was synchronized ten minutes later.

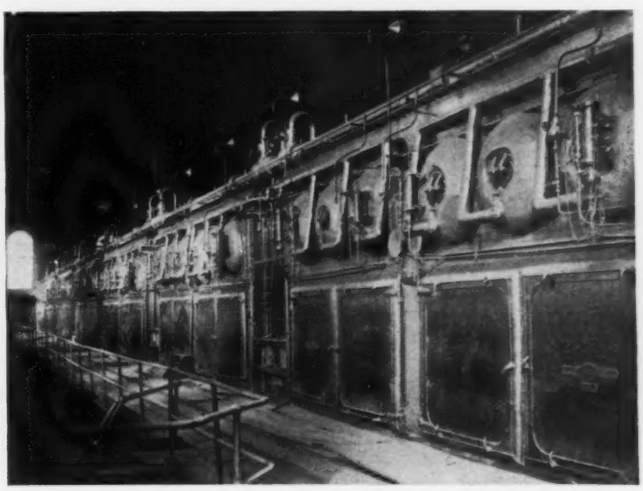
Plant carries load

The remaining 10,000-kw. machine was operating as a synchronous condenser with the turbine uncoupled. This machine was reassembled, tested and was being synchronized at 6:30 a.m. December 7, when the main bearing at the governor end burned out, resulting in damage to the machine requiring the spindle to be returned to the factory.

Generation on the operating machine was increased steadily so that 24 hours after the notice was received by the company the hourly generation was more than 16,000 kw., and was 22,000 kw. by 9 p.m. December 8, with peaks in excess of 24,000 kw.

The "six-hour test" Commissioner Beamish later called for was discontinued at 8 a.m. December 9, after





FROM DARKNESS TO LIGHT—This steam and electric generating station of Pennsylvania Power & Light Company at Allentown, held as a cold reserve, came under fire of the state utility commission when a "theoretical" breakdown of service was ordered for a "test" run. The unprecedented action was to test the value of the emergency service plant

the three machines in service had each separately and in combination demonstrated their ability to carry loads in excess of their rating.

Mr. Reinicker stated that at the Westinghouse shop it was found that the shaft of the 10,000-kw. machine was slightly warped. During the test, Mr. Reinicker said, a commissary was set up in the shop and the operating personnel was put on two twelve-hour shifts. More than 100 men were on the job putting the plant in operation.

The action of Mr. Beamish was based on the new utility regulatory law which places the burden of proof on the utilities. Commission engineers estimated that the cost of the stunt was "terrific," in which case this extraordinary expense item will have to be considered by the full commission when it sets electric rates to customers.

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Housing Report Shows Potential Usage Rise

A potential increase of 10 per cent in energy use by domestic customers is indicated by the report forwarded last week to President Roosevelt by Monsignor John A. Ryan, chairman of the National Housing Committee.

The report stated that the construction of 3,000,000 new dwelling units, the majority to cost less than $3,000 to build and under $30 a month to rent, would be needed to bring urban housing standards in the United States up to the 1930 level. Such construction, the report said, might be spread over the next two years.

At present the average use per domestic customer is near 800 kw.-hr. per year. Assuming that tenants of the 3,000,000 new dwellings, who would obviously be in the low-use group, would use an average of 400 kw.-hr. per year, a total annual consumption of 1,200,000,000 kw.-hr. is obtained. Annual energy consumption by domestic customers now amounts to about 15,000,000,000 kw.-hr.

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Says FPC Hinders Expansion

Senator Bailey (Dem., N. C.) contended on the Senate floor this week that policies of the Federal Power Commission were preventing the Aluminum Company of America from expanding its facilities. He said the commission had declined to permit the company to build several dams in North Carolina.

Power Engineers Treat Troubles in Operating Superposed Units

Growing pains difficulties encountered in getting new capacity of high-pressure units on line to carry growing loads — Correctives found promise expected reliability and economy of added generation

Getting the new crop of superposed and higher pressure steam plants into operation has not been accomplished everywhere without troubles that some called "growing pains" at the A.S.M.E. national session last week.

Under the chairmanship of E. B. Ricketts, Consolidated Edison, representative engineers told what had in some instances delayed scheduled operation at some of the nine recent high-pressure and higher temperature installations discussed. Neither alarm nor pessimism dominated the recital of equipment and erection weaknesses, just a frank recording of annoyances.

X-ray shows faults

Of the total of 138 joints X-rayed at Waterside, 26 had to be rewelded and six of these had to be cut out and remade, according to J. W. Landis. At Springdale the feedwater is being supplied at 230 deg. (although designed for 425 deg.) because of unavailability of a feedwater heater. J. F. Muir said this called for a 20 per cent increase in boiler heat input per pound of steam, calling for more volume and higher temperature of flue gases and increase in damper action.

At Rivesville the 400-deg. feedwater is functioning satisfactorily. At Fisk station (Chicago) provision for hand cleaning of the boiler in event of failure of mechanical facilities has, in the estimation of A. E. Grunert, proved a wise decision. Leaks at economizer drum connections were corrected by seal welding.

Bypass for low-pressure operation independently of topping disclosed one difficulty; the 195-lb. quick-opening valve stuck, and this was corrected by providing a positive pressure for opening it. At one time the whole installation had to be shut down because certain valves refused to function; steam scrubbers ameliorated this type of failure. Grunert, commenting on the growing complexity of water paths, said route maps and traffic signs might have to be provided so the water would know where it was supposed to go in its meandering through boiler and accessories.

Slag accumulation at West End (Cincinnati) was such in one week that superheater temperature rose 60 deg. Redesign ahead of superheater gave the anticipated results, along with adoption of coal of lower ash fusion temperature. D. T. Brown advocated more clearance in pumps to afford a little more margin under wide range of emergency operation conditions.

Report boiler troubles

At Millers Ford (Dayton) various difficulties reported by C. H. Spiehler resulted in 47 per cent outage, the operating time being 2,867 hours, with 2,557 hours out of service for one boiler. Boiler troubles accounted for 1,515 hours, valves 464 hours and other troubles 578 hours; for the second boiler the outage percentage was 38.4 per cent, with the corresponding outage hours 958, 153 and 88. Rate of feed had to be held equal to steaming output in order to check the swinging of water level, which was aggravated by priming and the type of feedwater regulation employed. Fan and motor bearings, pump shaft packing, pump casing erosion, reducing-valve stem vibration leading to valve sticking were other minor troubles. Turbine outage for one week was attributable to failure of a 12-in. motor-operated gate valve. Of 1,015 hours air was used for generator cooling 248 and hydrogen 767, with corresponding outputs of 2,500,000 and 5,300,000 kw.-hr.

Shaft currents were the only sizable difficulty reported by Philip Sporn for Logan and it caused a fear of bronze electrolysis in the governor. Insulation was inserted in the generator bearing to correct the condition. No significant troubles in tubes, economizer, superheater or pumps were had here. Coal quality is preventing full capacity expected of the pulverizers. Leak-offs are twice the expected amount. Hydrogen cooling adds 20

per cent to the rating when its pressure is raised to 15 lb. Leakage of gas amounts to $6 per week.

Leak trouble in Omaha

Omaha, reported through Louis Elliott of Ebasco Services, had troubles with leaks. Joints had been X-rayed. Turbine outage of six weeks resulted from loss of first stage blading, probably due to admission of some foreign object. Safety valves at Northeast station (Kansas City) were inaccurate as to popping pressure and one required 100 lb. drop before reclosing. It took 2½ days to set safety valves.

Availability of the Twelfth Street installation in Richmond has been better than 80 per cent. J. A. Reich said they expect to run six months and then only have to shut down two days. Superheat is 710 instead of 835 deg. Temperature readings all through the boiler system gave no answer, but CO_2 determination at the superheater revealed air leaks. The Cottrell precipitator gets 60 per cent of the removed ash as fly ash and the rest is removed as slag. Scrubbing is preventing diminution of turbine capacity. It is expected that maintenance on pulverizers will be less than 1 cent per ton.

Electrical ignition of preliminary oil firing at the coal burners has, according to W. E. Caldwell, proven a great asset at Waterside. Serious leakage in the hydrogen seal forced a shut-down and there was also trouble with the bellows of an expansion joint in the 200-lb. line. Feedwater pumps, motor lubrication and controls were other difficulties. Cracks in the shrouding ring of the first row of impulse blading of the turbine were detected and corrected at the factory and at the same time the coupling was improved and it has reduced vibration of the 3,600-r.p.m. unit. Stack dust elimination by the Cottrell installation is wholly satisfactory and it is anticipated that the expected performance of the whole installation will be fully realized.

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Power Selling Needs More Sales Efforts

There's too much engineering and not enough salesmanship used in selling power to the oil industry, said F. M. Austin, president of the Petroleum Electric Power Club at the ninth annual conference of the club in Shreveport last week. This was reinforced by the informal talk of E. L. Schreiffer on selling benefits, not products or services, and culminated in a lively discussion of the club's plans for advertising in the ensuing year as stated by W. H. Stueve.

It was indicated by the trend of the discussion that the club would make a strong effort to insure that the interested electric utilities will have adequate showing in the equipment exhibition accompanying the annual meeting of the American Petroleum Institute in Tulsa next year. Although the club has had space in these shows in years past, it has been the invariable condition that the representation of electrical applications and of utility power for them has been almost entirely overshadowed by much more numerous and elaborate displays of competitive mechanical equipment.

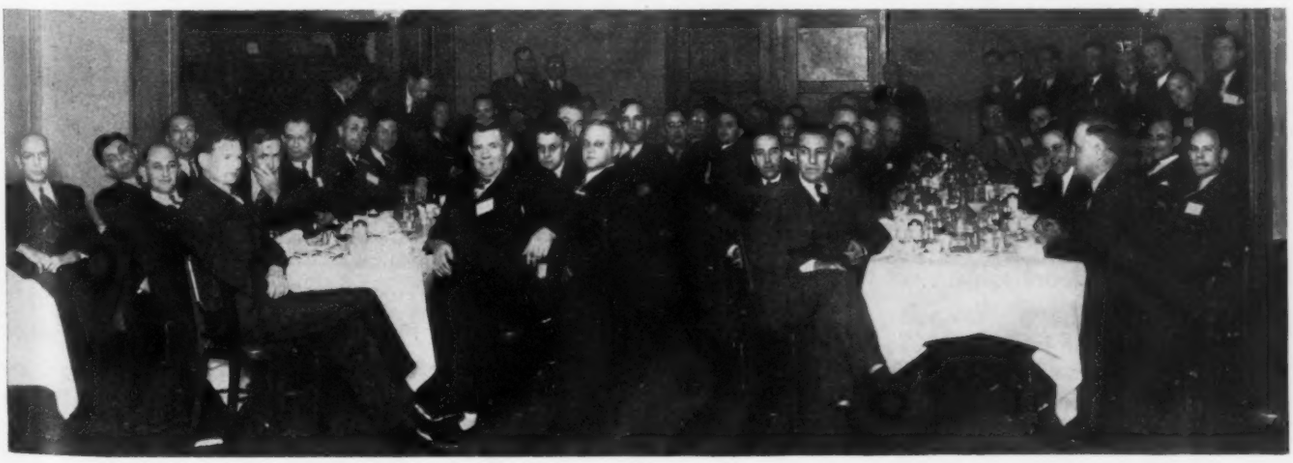
Evidence that the principles of salesmanship are being applied to the sales of power for oil production, pipe line pumping and refining appeared in the three papers on these subjects by R. E. Patrick, F. A. Graham and K. K. Kreamer, respectively. Mr. Patrick stated fifteen reasons—and said he could bring forward fifty—why the oil producer should pump his wells with electric motors and buy the power to run them. The same theme of benefits to the buyer appeared in the Graham and Kreamer papers and in the discussions that followed the three.

Directors of the club chosen for the 1938-39 term are: Harry Roberts, Empire District Electric Company; F. A. Graham, Kansas City Power & Light Company; G. W. Weckel, Kansas Gas & Electric Company; W. H. Stueve, Oklahoma Gas & Electric Company; E. A. Armstrong, Public Service Company of Northern Illinois; J. E. Elliot, Southwestern Gas & Electric Company. The directors elected C. N. Robinson, Public Service Company of Oklahoma, president; O. W. Jones, Central Power & Light Company, vice-president, and Harry Roberts, Empire District Electric Company, secretary-treasurer.

•

Open Rate Cut Negotiations

Negotiations to effect voluntary electric rate reductions by three major companies in New Jersey have been started by the Public Utilities Commissioners and officers of the companies. The companies are Public Service Electric & Gas, Jersey Central Power & Light and New Jersey Power & Light.



POWER CLUB—Members of the Petroleum Electric Power Club at Shreveport, La., during the ninth annual conference went on record urging greater use of electricity for oil production, pipe line pumping and refining. Plans are being made for a gigantic electrical equipment display at the American Petroleum Institute meeting next year at Tulsa

Road Builders Urge Highway Light Plan

The American Road Builders' Association will be asked at its convention in Cleveland in January to get behind highway lighting as a means of reducing night driving accidents. Its committee on highway illumination has drafted a resolution urging the association vigorously to advocate:

1. Installation of adequate highway lighting on heavy traffic highways connecting cities.

2. Similar lighting for new highways where there is a heavy traffic expectancy.

3. Installation of highway lighting on five or more mile stretches in other sections of populous states where traffic and accident records indicate lighting would prove beneficial.

•

Stockholders to Ratify Additional Preferred Stock

A special meeting of Cumberland County Power & Light Company stockholders will be held on December 20 to take action on a proposal to authorize directors to issue all or any part of 10,000 additional shares of 5½ per cent cumulative preferred stock. There are 10,000 shares of this issue already outstanding, and in addition, 40,236 shares of 6 per cent cumulative $100 par value preferred stock. Stockholders will also be asked to approve the cancellation of one share of $50 par value common stock, which is the entire amount outstanding of this issue. The company has outstanding 47,199 shares of no par value common stock.

Cumberland County Power & Light Company is engaged in a large power development program at Saco, Maine, and it is presumed that proceeds of the proposed preferred stock financing will be applied toward the financing of this program.

•

Union Carbide to Build Plant Near Wilson Dam

Electro Metallurgical Company, subsidiary of Union Carbide & Carbon Corporation, has purchased 299 acres on the Tennessee River, near the Wilson Dam, as the site of a new plant for the production of calcium carbide and ferro-alloys and other electric furnace products, construction to start before March 1, 1938.

A contract has been signed with the Tennessee Valley Authority for power for 20 years beginning January 1, 1939, with an annual consumption of power estimated locally at around $750,000. Local reports place eventual cost of plant at $5,000,000, though management states initial expense will be less.

•

Bay State Utilities File Liquidation Plan

On December 20 the Securities and Exchange Commission will hear plans for the voluntary liquidation and termination of three subsidiary holding companies of Massachusetts Utilities Associates, filed under the provisions of the Public Utility Holding Company Act of 1935.

Under the proposals the Massachusetts Lighting Companies, Central Massachusetts Light & Power Company and Commonwealth Gas & Electric Companies would pass out of existence and all of their operating companies would become operating subsidiaries of Massachusetts Utilities Associates, thus complying with provisions of the act providing for the elimination of intermediate holding companies beyond the first degree.

Massachusetts Utilities Associates is a holding company in the system of the New England Power Association, a registered holding company.

Meetings

Louisiana Engineering Society — Annual meeting, St. Charles Hotel, New Orleans, La., January 7-8. A. M. Hill, secretary-treasurer, 422 St. Charles Hotel, New Orleans.

American Engineering Council—Annual meeting, Mayflower Hotel, Washington, D. C., January 13-15. Frederick M. Feiker, executive secretary, 744 Jackson Place, Washington, D. C.

American Institute of Electrical Engineers —Winter convention, New York, N. Y., January 24-28. H. H. Henline, national secretary, 33 West 39th Street, New York, N. Y.

Canadian Electric Association — Annual winter conference, Windsor Hotel, Montreal, Que., January 31-February 1.

National Electrical Manufacturers Association—Midwinter meeting, Waldorf-Astoria Hotel, New York, N. Y., February 7-12. W. J. Donald, managing director, 155 East 44th Street, New York.

Pacific Coast Utility Plans Budget for Year

Expenditure of approximately $26,000,000 will be made by Southern California Edison Company, Ltd., according to the 1938 budget, for new construction, operation, maintenance, payrolls and taxes, which has been approved by directors. This compares with $22,000,000 for these items in the 1937 budget. Anticipated expenditures for 1938 are exclusive of bond interest and other disbursements for account of capital.

New construction for next year will include the completion of facilities for bringing Boulder Dam power into the Edison system. Expenditure of approximately $600,000 for completion of the transmission line and $1,130,000 for extension of the Chino station is planned.

The addition to expenditures for Boulder transmission lines, other transmission line cost and preliminary work in connection with construction of a new major switching station are expected to come to another $1,000,000.

•

Court Extends Utility Plan

Federal Judge W. H. Holly has extended to December 24 the time for filing new plans for reorganization of the Utilities Power & Light Corporation under Section 77b of the amended Bankruptcy Laws. The new date was set to enable the company's directors to formulate a plan after the annual meeting of stockholders on December 17. The judge also appointed Willoughby O. Walling permanent trustee of the company.

•

N. Y. Steam Shares Deposited

Ninety-two and four-tenths per cent of outstanding New York Steam Corporation preferred shares has been deposited for exchange for Consolidated Edison Company $5 preferred stock.

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Alabama Power Bill Inclosure

Alabama Power Company recently inclosed with bills a booklet on proper lighting in the home. More than 3,200 voluntary responses were received, representing almost 4 per cent of the company's residential customers.

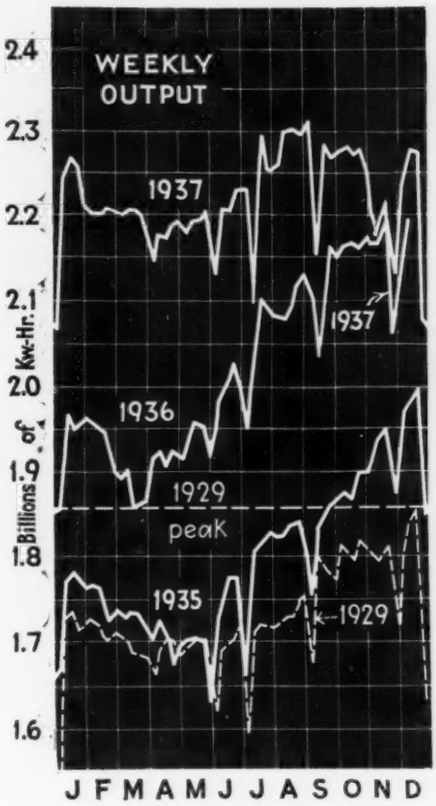
Output Still Under 1936

Energy rises to winter peak — Gains in West — New England and Central area down

Exceeding the figure for the preceding week by 43,000,000 kw.-hr., energy production by the electric power and light industry during the week ended December 11 rose to 2,196,105,000 kw.-hr., according to the Edison Electric Institute. It failed to match last year's output for the corresponding week by 2.1 per cent.

Usually the two weeks in the middle of December show a peak higher than at any other time of the year. Present operations are abnormal in that production is fully 100,000,000 kw.-hr. less than it was during the latter part of last summer, although the rise from the low point caused by the Thanksgiving holiday has followed the customary pattern.

Only two geographical regions, those constituting the far West, show continued gains over 1936. The greatest deficiency was registered in New England, down more than 11 per cent for the third consecutive time.



Weekly Output, Millions of Kw.-Hr.

1937	1936	1935
Dec. 11...2,196	Dec. 5..2,244	Dec. 7..1,970
Dec. 4...2,153	Nov. 28..2,134	Nov. 30..1,877
Nov. 27...2,065	Nov. 21..2,196	Nov. 23..1,953
Nov. 20...2,224	Nov. 14..2,170	Nov. 16..1,939
Nov. 13...2,177	Nov. 7..2,169	Nov. 9..1,914
Nov. 6...2,202	Oct. 31..2,176	Nov. 2..1,897

Per Cent Change from Previous Year

Region	Week Ending Dec. 11	Dec. 4	Nov. 27
New England	—11 5	—12.5*	—12 0*
Middle Atlantic	— 0 8	— 2.1*	+ 0.2*
Central Industrial	— 7.1	— 6.9*	— 5.8*
West Central	— 1.0	— 1.6*	— 0.9*
Southern States	— 2.8	— 5.4*	— 3.0*
Rocky Mountain	+11.4	+11.6*	+10.6*
Pacific	+ 2.5	+ 3.5*	+ 5.3*
United States	— 2.1	— 4.1*	— 3.2*

*Adjusted for holiday conditions.

Rural sales during the month indicate a 42.9 per cent increase in revenue 49.3 per cent increase in kilowatt-hours and 36.6 per cent increase in the number of consumers. They are almost double the percentage increases recorded for the similar month in 1936 over 1935.

•

$1,800,000 Expended by Seattle Utility

An expenditure of $1,800,000 for expansion and improvement of the Puget Sound Power & Light Company's system during the first ten months of this year, and procedure with similar work which will add approximately $200,000 to that figure by the end of this year, has been announced by Frank McLaughlin, president of the company. Of the total expended during the ten-month period $800,000 was applied to extensions of existing lines to serve new customers, 8,431 of whom were signed in that period.

During the same period, Mr. McLaughlin stated, 7,713 new major appliances—ranges, refrigerators and water heaters—were sold and installed. It is estimated these installations will increase the company's revenues about $140,000 a year.

•

Power Consumption in Texas

Electric power consumption in Texas during October declined more than the usual seasonal amount from the preceding month, but was still well above the corresponding month last year, according to the University of Texas Bureau of Business Research.

Reports from fifteen electric power companies, representing a large percentage of the electrical energy produced in this state, reported consumption of 163,789,000 kw.-hr. during October, a decrease of 10.2 per cent from September, but an increase of 14.6 per cent over October last year.

•

Nebraska Power Sales Ahead

Major appliance sales of the Nebraska Power Company for the first ten months of 1937 amounted to 6,717, compared with 6,426 for the corresponding period last year. Sales of electric ranges were 252, as against 129; refrigerators, 6,399, as against 6,195, and water heaters, 66, compared with 102.

TVA Power Without the Gates

TVA power is flowing into Arkansas through the new TVA substation at the outskirts of Memphis, James A. Barr of the TVA legal department has announced. Mr. Barr said the transmission line, constructed by TVA from its Pickwick Dam to Memphis, is carrying 110 kv. to the Arkansas Power & Light Company. Use of the power for Memphis municipal distribution probably will not be made until early in 1938.

•

Major Appliance Sales Ahead

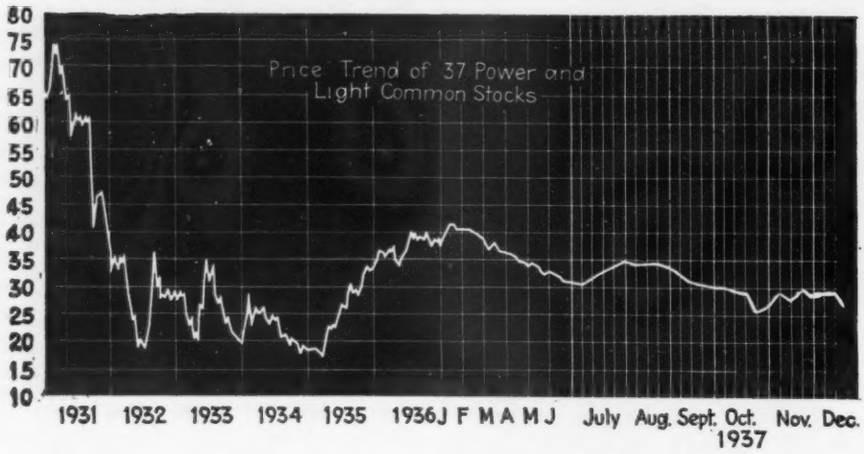
Electric range, refrigerator and water heater sales by Georgia Power Company for the first ten months of 1937 totaled 17,145, as against 14,990 for the corresponding period last year. Range sales showed a decrease from 5,672 to 5,484; refrigerators, with 8,330 as against 6,144, and water heaters, with sales of 3,331 as against 3,174, put the total period ahead.

•

Electric Sales in Illinois Up; Rural Sales a Feature

Eleven large companies in Illinois, reporting total sales of energy to ultimate consumers for October, 1937, as compared to the same month in 1936, show gains of 6.8 per cent in revenue, 4.5 per cent in kilowatt-hours and 2.6 per cent in the number of consumers. The percentage increases in revenue and kilowatt-hours this month are considerably lower than those recorded for the similar month in 1936 over 1935, while the 2.6 per cent increase in the number of consumers this month is only slightly lower than the percentage increase recorded in October, 1936, over 1935.

Utility Stocks Move Lower



Utility stocks eased off somewhat this week, influenced, probably, by the war scare, which was lessened Tuesday last after having sent 911 issues generally lower Monday. "Electrical World" index, 27.4; previous week, 28.1; year ago, 38.1; 1937 high, 41.5

Plans to Dissolve Two Operating Units

Keokuk Electric Company of Hamilton, Ill., has asked Securities and Exchange Commission permission to issue common stock in a plan to eliminate two operating companies and one intermediate holding company from North American Company system.

The stock would be issued to Fort Madison Electric Company, Fort Madison, Iowa, and Dallas City Light Company, Dallas, Ill., which would be dissolved in exchange for their assets. These companies and Keokuk Electric are subsidiaries of Central Mississippi Valley Electric Properties, a subsidiary of Union Electric Company of Missouri, a North American System holding company. Securities received by Fort Madison Electric and Dallas City Light would be distributed to Central Mississippi Valley properties, which would be dissolved into Union Electic Company of Missouri.

Keokuk name would be changed to Union Electric Company of Iowa.

•

Authorize Consumers Power $12,000,000 Bond Issue

Consumers Power Company has been authorized by the Michigan Public Utilities Commission to issue a $12,000,000 bond issue, $9,000,000 immediately and the balance subject to later approval, for a $17,943,500 construction program.

Construction program includes new plants at Saginaw and Kalamazoo which will generate 70,000 kw. and 35,000 kw., respectively. Commission ruled that company at this time could not use more than 56 per cent of the bond issue for its building program in order to preserve present ratio between debts and capital. Remainder must be paid from company resources.

•

Authorizes Stock Dividend to Avoid Excess Profits Tax

SEC permitted General Public Utilities, Inc., to issue stock for dividend payments to avoid the undistributed profits tax when it formally approved the declaration of the company covering issue of 26,909 shares of no par common stock. Dividend will be payable at the election of the common-stock holders as $3 cash or one-fifth of each new share for each share of outstanding common held. The actual cash to be paid is $150,612, or $3 per share on 37 per cent of stock, under agreement already made.

The commission stated:

> The declarant has stated it desires to declare and pay the dividend because of the undistributed profits provision of the revenue act of 1936. The commission finds the issue and dividend payment a necessary and urgent corporate purpose of declarant.

•

Toledo Bond Issue Approved

Ohio Utilities Commission has granted authorization to the Toledo Edison Company to issue and sell at par $2,000,000 of first mortgage 4 per cent bonds due 1942, and pending such sale to pledge the same as security for 4 per cent notes of a similar amount to the Chase National Bank due August 1, 1941. Of the total amount, $679,000 will be used to reimburse its treasury for capital expenditures. The balance of the loan will be released upon validation of the commission for 75 per cent of actual expenditures on a budget for improvements estimated at $1,951,000.

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Utility Dividends— Extras and Arrears

Many electric light and power companies have recently declared extra, year-end and arrears dividends. Among them are the following:

North American, final dividend on common, 70 cents, payable December 23 to holders of record on December 10. Also declared regular quarterly dividend of 75 cents per share on the preferred stock payable January 3 to holders of record December 15.

American Gas & Electric, extra 35 cents and the regular quarterly of 35 cents on the common. The regular quarterly is payable in December instead of in January as heretofore.

Florida Power & Light Company has declared a dividend of $1.75 per share on $7 preferred stock and $1.50 per share on $6 preferred stock, payable December 21 to stockholders of record December 6. Bryan C. Hanks, president, stated that the substantial increase in business in the area served by the company and recent freedom from hurricane losses have made this dividend possible. He said that if business continues good in Florida and if the Miami rates case is disposed of, as has been indicated recently by Miami officials, it is hoped that the company may be able to determine a more definite dividend policy than circumstances in the past have permitted. These will be the first dividends paid on the preferred stocks since 1933.

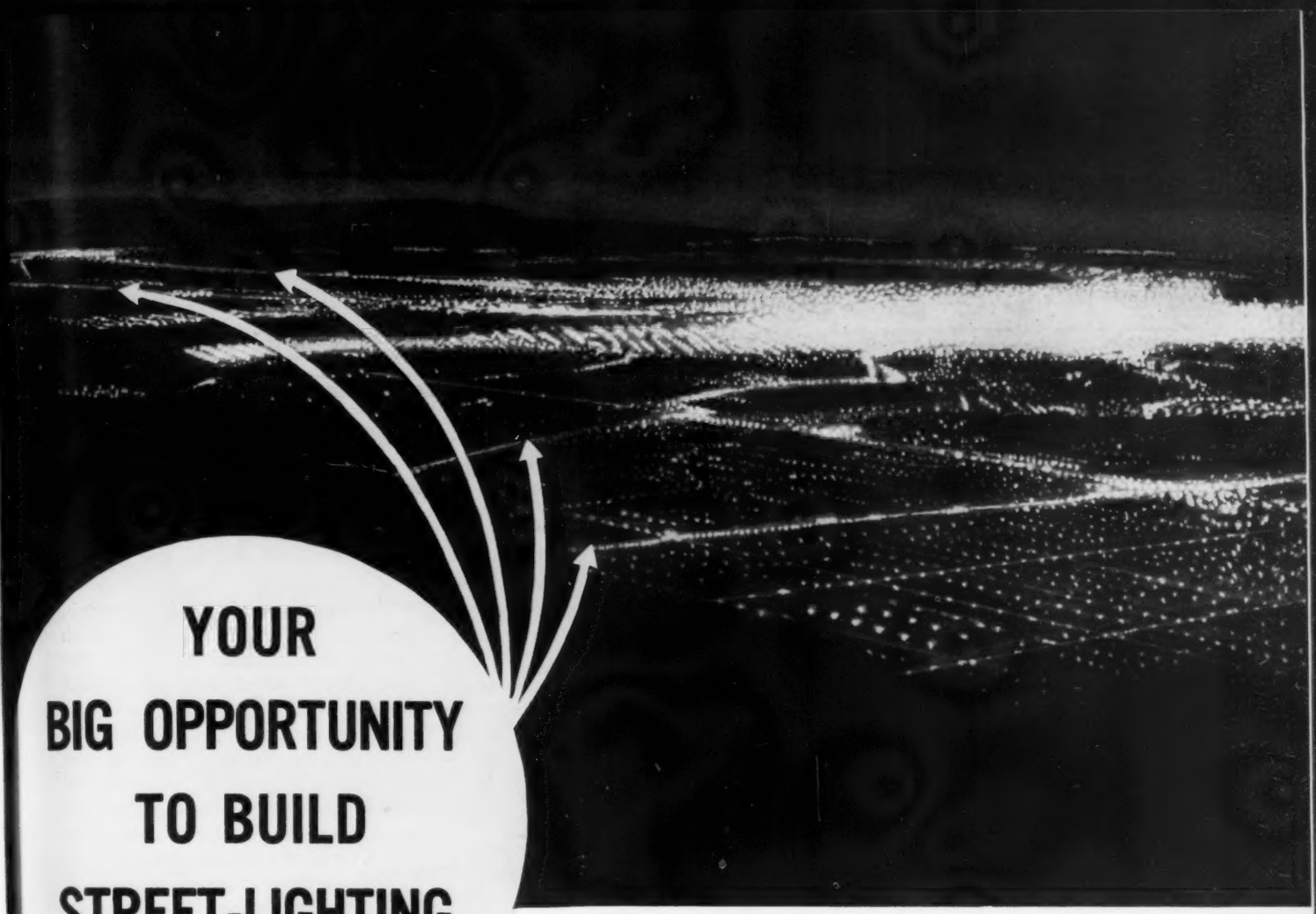
Dividends of $1.16⅔ on the $7 preferred and $1 on the $6 preferred were announced by the Utah Power & Light Company. On October 1 dividends of the same amount were paid against arrears.

Pennsylvania Water & Power Company declared a quarterly dividend of $1.25 a share on the $5 preferred stock. An increased dividend of $1.50 a share also was voted on the no par common stock for the December quarter.

Utilities Reports (Earnings)

	New Income 1937	1936
* Penn Pwr. & Lt.	$8,151,206	$8,041,599
* Virginia Elec. & Pwr.	2,235,600	1,957,372
* Oklahoma Gas & Elec.	2,762,151	2,260,476
* Utah Pwr. & Lt. and subs.	1,713,666	1,222,985
* New Orleans Pub. Ser.	1,064,260	438,946
* Idaho Power	1,353,586	1,175,073
* Dallas Pwr. & Lt.	1,567,890	1,417,736
* Calif.-Ore. Pwr.	1,029,714	1,019,862
* San Diego Cons. G. & E.	1,356,837	1,330,138
* Nevada-Calif. Elec. and subs.	702,145	918,688
* Pacific Pwr. & Lt. and sub.	788,383	753,075

* Twelve months ended October 30.



YOUR BIG OPPORTUNITY TO BUILD STREET-LIGHTING LOAD

Light The Traffic Arteries First

IS your community aware of the fact that improperly lighted main traffic arteries are TEN TIMES MORE DANGEROUS AT NIGHT THAN DURING THE DAY? These streets must be lighted immediately to stop these nightly traffic fatalities. Public officials will welcome your suggestion of improved lighting on their most dangerous thoroughfares as a prompt method of preventing these night accidents.

The relighting of dangerous thoroughfares has become an opportunity and an obligation. To help you do your part—to help you prove the value of adequate lighting—we have prepared an attractive direct-mail program which we shall be glad to mail to public officials on your lists, or which you can mail to them. Your G-E lighting specialist will furnish you with details concerning this program. General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

Filing No. 3010

500-251

Field OPERATING PRACTICES

New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

New Storage Idea for Electric Meters

In addition to consolidating all service departments in a carbarn, the physical reorganization of Utah Power & Light Company's service units in Salt Lake City this fall is interesting because it gave rise to a space-saving method of storing meters.

The unusual use of heavy wire fence for partitions—a method of partitioning which was adaptable to the concrete carbarn structure—was the incentive for adopting the space-saving method.

Previously the meters had been mounted on a pipe and angle iron rack. This was discarded and a simple hook of galvanized wire was designed for attaching to the wire-mesh wall. The hooks were fashioned so as to maintain a fixed position with respect to the wall, thus allowing a man to carry and hang two meters, one in each hand.

Meters are tested three floors up, and transportation of meters between the two floors is effected by a dumbwaiter. Only a few meters are kept in the test room at a time. To facilitate handling, both in test and store rooms, George Hackwell, who developed the meter support idea, is designing a special dolly.

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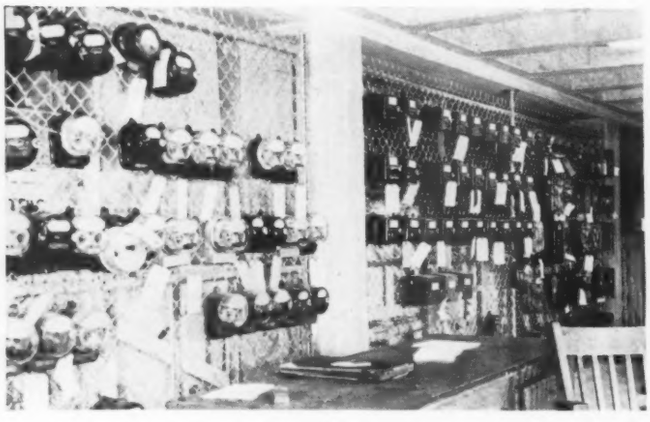
Recording and Using Line Troubles Data

By P. N. KENT
Kansas City Power & Light Company, Kansas City, Mo.*

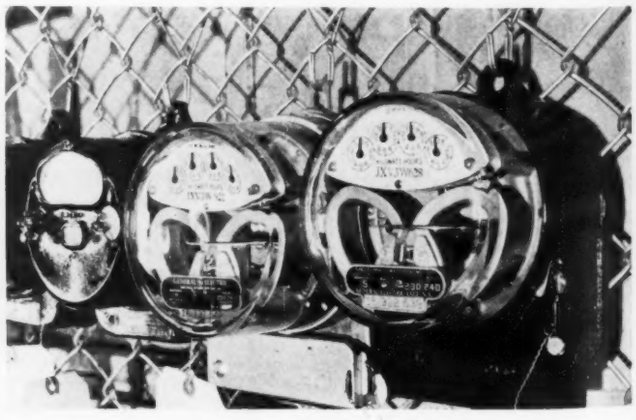
Examples of faults that developed in overhead line equipments and that were disclosed by analysis of the line troubles data records of the Kansas City Power & Light Company, which have been the subject of this series of items, are now given to instance the definite value of these records.

* Seventh installment of a series from paper to Missouri Valley Electric Association.

The first example is of a certain make of 35-kv. pin insulator which began to develop trouble in 1929. The first effect noticed was an unusual number of insulators that were leaking over in wet weather. An intensive inspection of the insulators removed showed that those in question had developed cracks in the top shed, the crack developing so far in some cases that half of the top shed would pull away from the cemented joint and fall entirely off when the tie wire was removed. A further investigation showed that all of the insulators so found were of the same make and purchased at the same time. As a result of conferences with the manufacturer it was determined that the apparent cause was a faulty cement that had been used on one lot of insulators manufactured. This cement allowed the entrance of moisture into the joint between the top and bottom shed, the resultant freezing and thawing action causing mechanical strain and weather cracking. The manufacturer deter-



In order to save space the wire-mesh walls of the storeroom were used as racks on which to hang meters

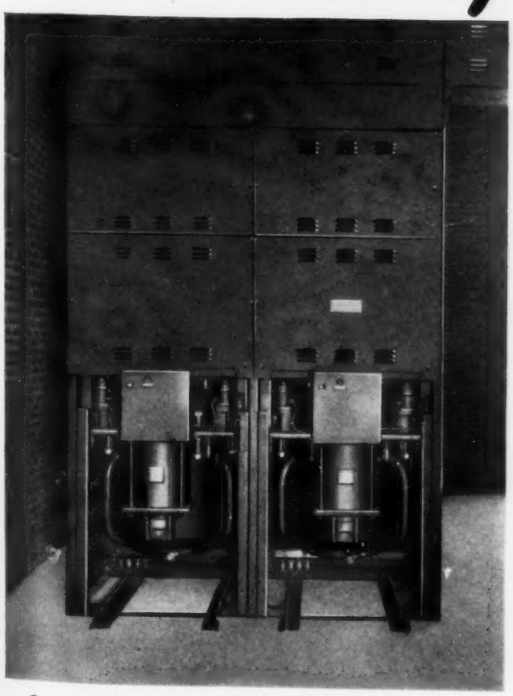


Hooks, uniformly fabricated of galvanized wire, were run through the mesh, thus rigidly fixed so meters could be easily hung

RDAY, DECEMBER 4, 1937
ESCAPED MONKEY ELECTROCUTED
Killed Exploring High-voltage Circuit in Local Power Plant—
Bored with the routine of everyday life, "Jake," monkey performer deluxe, forsook his restricted quarters yesterday afternoon to make an extensive tour of the city. His excursions led him through an open window of the local power plant where he jumped among the 2300-
exposed busbars above the
his tiring legs.

SURELY THE MORAL IS:

Don't "monkey" with obsolete switchgear



Some of the modern G-E equipment now installed

THIS news clipping reports an actual experience of a power company with an old substation that had recently been acquired from one of its customers. It serves to emphasize again that switchgear which was the best available years ago is far below the standards of today.

This same power company is now modernizing with G-E switchgear. One installation of metal-clad, with *enclosed bus runs*, is shown here. This equipment offers, besides the utmost safety, the many other advantages of modern factory-built, shipped-assembled switchgear. It not only saves installation expense but, with better co-ordination of all the devices, it assures a greater degree of reliability. Why not discuss these points with your G-E switchgear specialist? General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

890-45

mined that only one group of insulators had been sent out in this condition and that part of the shipment to our company consisted of a number of these insulators. A careful inspection was made of all of this type of insulators in service on our lines and the bad ones were all replaced. Since that time no trouble of this sort has been experienced.

A second example of faulty material found was of a similar nature. In this case two different makes of fuse mountings were involved. These cemented joints allowed the entrance of moisture with the resulting weather cracking of the insulators. This trouble was noticed and analyzed by means of data from the operating records and the defective mountings were replaced with new types not subject to the trouble in question.

A third example of trouble found by means of the report data was a certain make of lightning arrester that was found to allow the entrance of moisture by breathing action through the cap seal. This moisture caused a green corrosion to form inside the arrester on the gap structure, in many cases entirely shorting out the gap, thus causing the arrester to lose its effectiveness. As a result of the trouble the manufacturing design was changed and the faulty arresters were replaced with arresters not subject to this difficulty.

In all of the above cases the equipment manufacturers fully co-operated with the company in finding the cause of the trouble. In every case satisfactory adjustments were made by the manufacturers to take care of maintenance cost and shortened life of the material caused by the defect.

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Maintaining Accurate Secondary Standards

By HARRY G. HAMMOND
Meter Standards Laboratory,
Detroit Edison Company

Adjustments and repairs on secondary standards, whether or not they affect accuracy, are regularly made in the meter standards laboratory of the Detroit Edison Company since the primary standards are right at hand for recalibrating. The secondary standards, as well as the primary ones,* have a regular schedule of checking and testing, but at shorter time intervals, as appears in the following routine:

Leeds & Northrup Timer (Constant-speed and constant frequency device)—Check frequency by means of synchronous timer against laboratory standard clock weekly. Allowable limits of error, 0.05 per cent.

Leeds & Northrup Synchronous Timers—This instrument receives a fairly good check in carrying out the above check on the Leeds & Northrup timer when both are used together. Allowable limits of difference, 0.02 second.

Leeds & Northrup Relays—Check the frequency of the fork weekly against the standard clock. Check the over-all accuracy of the constant-speed and constant-frequency device and Leeds & Northrup relays weekly. Allowable limits of error, 0.05 per cent.

Measure the resistance of the contacts on the Leeds & Northrup relays weekly. Allowable limits, 0.1 ohm.

Frequency Indicator—The frequency indicator that is used as a working standard is checked every three months by comparison with a standardized frequency source. The 60-cycle and convienent points of the scale, on each range of the instrument being tested, constitute a check. Limits of error, correction curve.

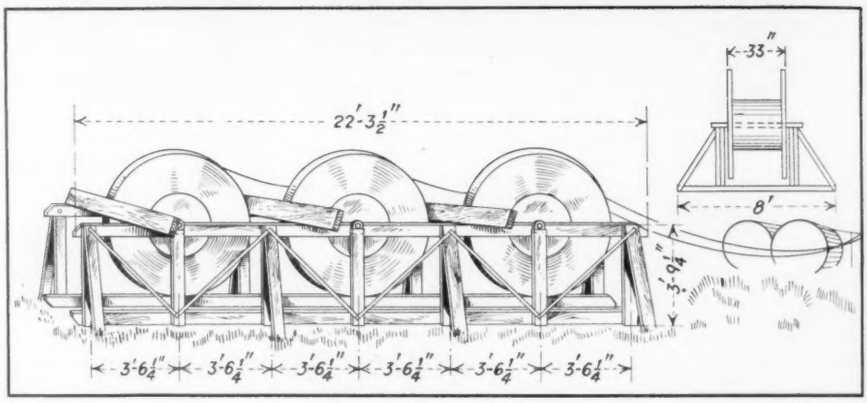
Voltmeter (Laboratory standard direct current)—Check in position weekly at zero and 8/10 of full-scale reading on 150-volt range. Check in position monthly at zero, 4/10 and 8/10 of full-scale reading on one range and at zero and 8/10 of full-scale reading on the other ranges. To determine the characteristic curve of the instrument, a check is taken once every year at zero and at every ten-division point to full scale. Allowable limits of error, 0.2 per cent of full scale.

Millivoltmeter With Shunts (Laboratory standard)—Check weekly in position at zero and ¾ of full-scale points on the 1.0 and 10.0-amp. range. Check monthly at zero and ¼, ½ and ¾ of full-scale points on one range and at zero and ¾ of full-scale on each current shunt on which it is used. To determine the characteristic curve of the instrument, a check is taken once every year at zero and at every ten-division point to full-scale on one range. Allowable limits of error for this instrument 0.2 per cent of full-scale.

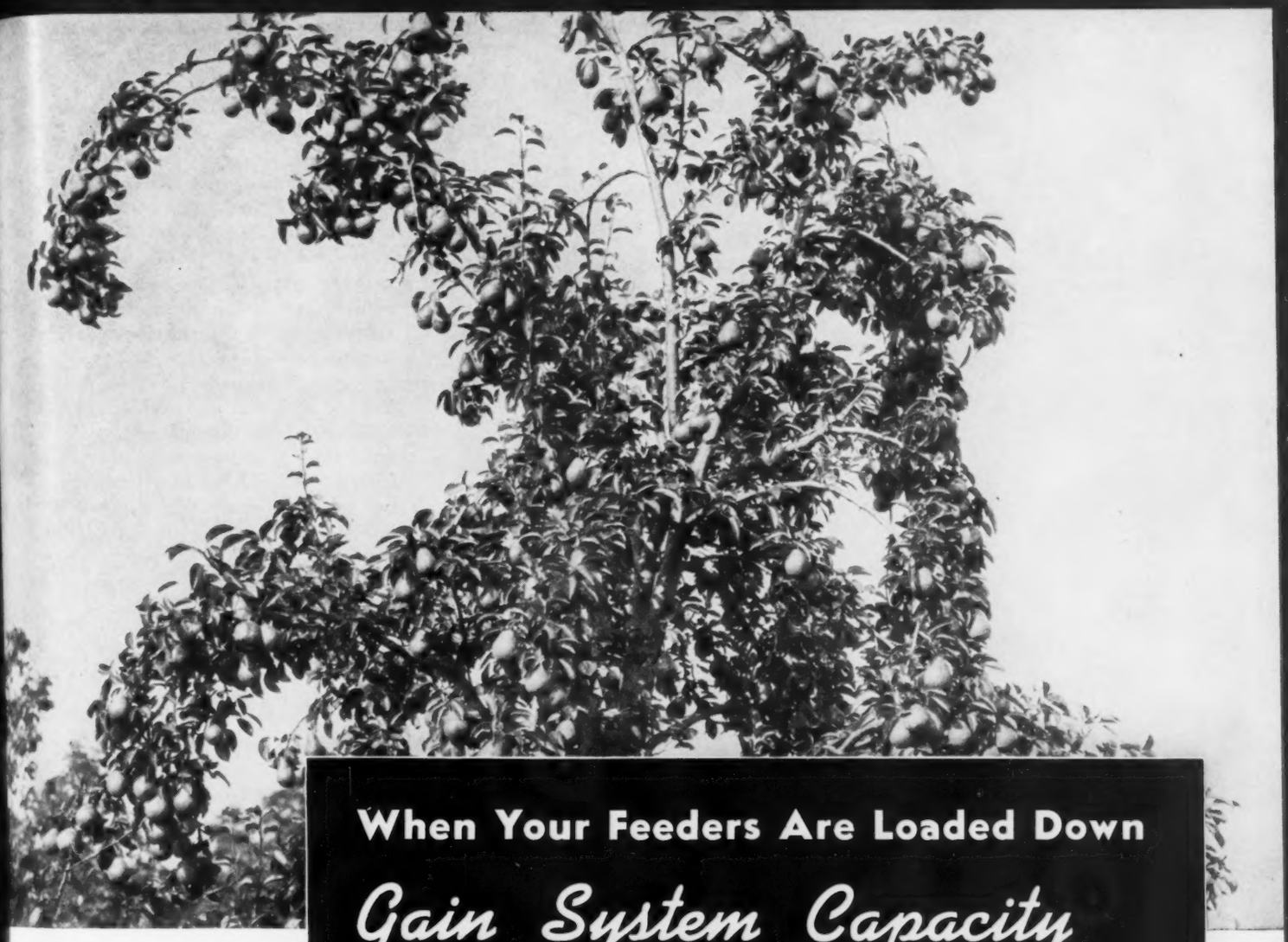
Voltmeter and Ammeter (Laboratory standard alternating current)—Check monthly at zero, 4/10, 6/10, 8/10 of full scale on one range and at zero and 6/10 full scale on other ranges. To determine the characteristic curve of the instrument, a check is taken every year at zero and at each cardinal point up to full-scale. All checks are made against the potentiometer

* See diagram of testing schedule, "Meter Department Standardization Routine," ELECTRICAL WORLD, November 6, 1937.

A REEL AID TO STRINGING

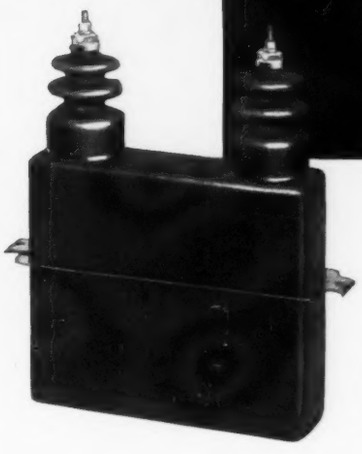


Stringing operations on the Cincinnati Gas & Electric Company's new tower line between Columbia Park and West End power stations were helped along when the illustrated reel rack was devised. When mounted on tractor wheels the rack can be easily hauled from one stringing point to another by truck or tractor. Two racks are used at each stringing point, one for the three-conductor reels and one for the ground wire. The dimensions of the conductor reel rack are given in the accompanying sketch.



When Your Feeders Are Loaded Down

Gain System Capacity with Capacitors



TO have the farthermost branches of your distribution system loaded down, almost overnight, is not unusual during this season of the year. Circuit capacities must be increased to handle the new power demand. Ten years ago, overloaded distribution circuits would usually have meant rebuilding old or adding new lines. Today, this is frequently unnecessary. Many power companies are using G-E Pyranol capacitors to increase load-carrying capacities and improve voltage conditions—in many cases at a fraction of the cost of other remedial methods.

In a typical case, two 180-kva capacitors installed on a utility feeder gave the following results:

First, feeder current was decreased 50 amperes per phase, and voltage drop reduced 40 per cent.

Second, feeder capacity was increased by 500 kw, saving $28,000 over the alternative of installing another feeder.

Third, the savings in I^2R losses and in revenue due to correcting the voltage more than paid for the capacitors in the first year.

Why not investigate this low-cost method of adding kw capacity to your system, and save time and money? General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

Filing No. 5700

360-132

using the mean of reversed readings. Allowable limits of error, 0.2 per cent of full scale.

Wattmeters (Laboratory standard model 326)—Check weekly against each other at 225 and 450 watts at unity power factor and 225 watts at 50 per cent lagging power factor.

Check monthly against two potentiometers at approximately 30, 60 and 90 per cent of full scale or a cardinal point reasonably close to these values, on one range also the 90 per cent point is duplicated on the other current and voltage ranges.

Check yearly every cardinal point on one range to determine the characteristic curve. All potentiometer checks are the mean of reversed readings on the wattmeters. Allowable limits of error, 0.2 per cent of full scale.

Transformers (Current)—All current transformers used as standards with the Leeds & Northrup (Silsbee) current transformer testing set and with laboratory standard wattmeter are interchecked yearly. The characteristic curves, ratio and phase angle of the laboratory standard current transformers are determined by checking as 1 to 1 ratio current transformers when possible. Return to the Bureau of Standards every three years. Limits of error, correction curve.

Transformers (Delta, Four-Wire, Three-Phase)—These transformers are checked every six months. The performances of these transformers are compared with a standardized transformer by means of standard test meters at unity and 50 per cent lagging power factor and current values of 1, 5, 10 and 50 amp. A 50-amp. test meter is used and corresponding current ranges are connected for the various test points. Deviations greater than plus or minus 0.5 per cent from the standard transformer will necessitate recalibration of the transformer.

Transformers (Potential)—Return to the Bureau of Standards every three years. Limits of error, correction curve.

Wheatstone Bridge—Check instrument every three months against standard 10–100—1,000-ohm resistances. Limit of error of rheostat coils, 0.2 per cent.

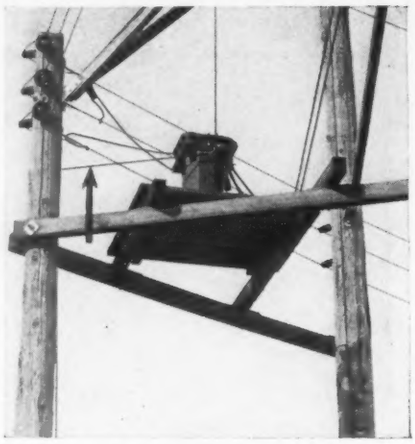
Kelvin Bridge Ohmeter—Check same every three months against standard resistance on one point on each range. Allowable limit of error, 2.0 per cent.

•

Load Transformers to Cut First Cost

By W. P. MEYER
Westinghouse Electric & Mfg. Co.,
Sioux City, Iowa

When selecting transformers for baseball field lighting it has been common practice to install 50-kva. transformers on lighting structures having a connected lighting load of the order of 40 kw. and 25-kva. units on the 20 kw. field lighting structures. Study shows that lights are on about 2½ hours per game and that advantage can be taken of the overload capacity available in certain types of transformers to reduce the installed kva. transformer capacity on jobs of this type.



Load ball field lighting transformers heavily

Rope and pulley arrangements operating breaker on transformer makes it possible to cut off certain lights during practice.

In lighting the field of the Mitchell, S. D., Baseball Association, a member of the Nebraska State League, eight structures were installed with a total of 120 1,500-watt, 115-volt lamps operated at 125 volts. Under these conditions the load was 114 per cent of normal. Twenty-three lighting units were installed on two structures, thirteen on two and twelve on the four others. Loads on the structures were 39.33, 22.23 and 20.52 respectively. Investigation showed that a 25-kva. type CSP transformer, starting at no load with an ambient temperature of 104 deg. F., would carry 175 per cent load for three hours, and therefore, considering the short operating period, would be ample for a load of about 20 kw. Therefore two 25-kva. and six 15-kva. type CSP transformers were selected to serve this installation.

In order to maintain service on the secondary and to replace lamps it is necessary with conventional transformers to have at least one disconnecting switch on the secondary of the transformer on each structure in addition to cutouts and lightning arresters. The secondary overload breakers on self-protected transformers did away with the need for the safety switches and additional savings were realized by elimination of cutouts and arresters, which are unnecessary with transformers of this type.

The accompanying tabulations indicate the saving in cost realized in this instance by the use of self-protected type CSP transformers operated at from 137 to 157 per cent loading for the relatively short periods involved in a baseball game. This installation has been used for a complete playing season when ambient temperatures were far above normal.

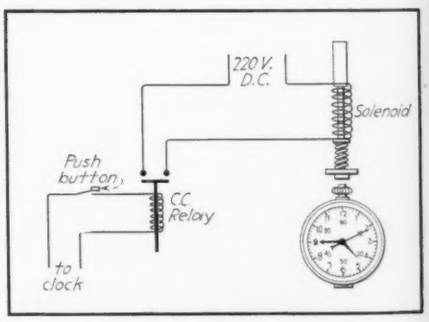
Cost of Transformers for Ball Field Lighting

Conventional transformers 2,400 volt to 120-240 volts	
2 37½-kva. transformers	$610.56
6 25-kva. transformers	1,369.44
2 2-pole safety switches, 400 amp.	49.50
6 2-pole safety switches, 200 amp.	69.30
16 arresters	99.68
16 cutouts and fuses	95.36
Labor mounting 16 arresters	32.00
Labor mounting 16 cutouts and fuses	32.00
Labor mounting 8 safety switches	24.00
	$2,381.84
Self-protected transformers	
2 25-kva. transformers	$511.20
6 15-kva. transformers	1,052.92
	$1,564.12

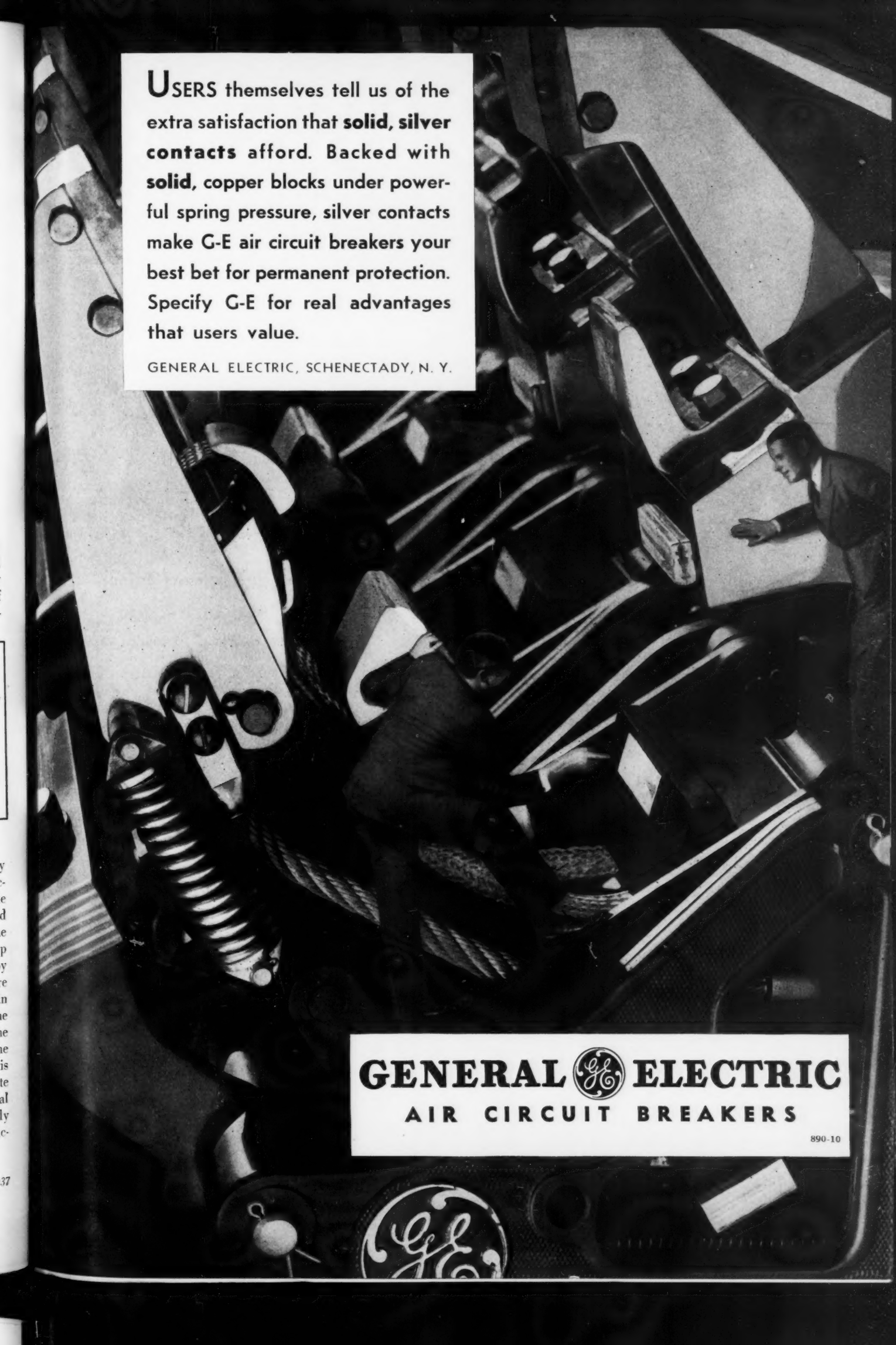
•

Standard Clock Checks Stop Watches

For routine check of stop-watch performance a simple device is used in the meter department laboratory of the Union Electric Company of Missouri, St. Louis. It consists essentially of a manually controlled relay circuit through which the next succeeding second impulse from the standard clock energizes a solenoid whose armature pushes the pin in the stem of the watch, starting the sweep hand. The seconds are counted by the ticks of the clock, and just before the final count the push button again is closed. The next impulse from the clock actuates the solenoid and the sweep hand stops—exactly on the proper second mark if the watch is right. This is a much more accurate method of checking than by manual operation of the watch, since the only chance for human error is in the actual counting of the clock ticks.



Stop watch checker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GENERAL ELECTRIC, SCHENECTADY, N. Y.
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AIR CIRCUIT BREAKERS
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New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

Surface Resistance Defies Fog and Smoke

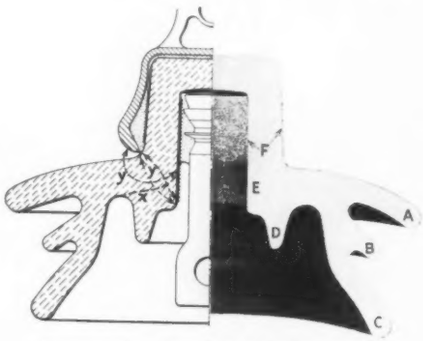
By JOHN J. TAYLOR
Development Engineer, Ohio Brass Company, Mansfield

Research showed that for satisfactory performance in districts exposed to fog or contaminating influences such as smoke, dust, cement, salt, oil spray and chemicals, a suspension insulator should have high resistance to corrosion, freedom from radio interference, long leakage distance, and high surface resistance and should provide for self-cleaning of exposed parts and for close coupling with liberal clearances between units.

Because corrosion is likely to occur in coastal fog areas, a recessed cement level between pin and porcelain was decided upon for an improved design. With this cement terminating on a level with the cap bead, the high flux density in this zone on energized units would produce corona and radio interference. Hence, flux termination point of the cement-pin mass was moved down from the zone of highest electrical stress.

Added protection against radio interference was provided by an inner petticoat—metallized in the pinhole—which acts as a flux control, causing the field from the edge of the metallizing to be directed into the porcelain instead of tangential to the surface. Metallizing was extended a short distance under cement surface, with which it made electrical contact, so cement and metallizing would be at the same potential.

Exterior petticoating, similar to that used in one-piece, multi-shed pin-type insulators, was designed to offer maximum exposure to cleaning by wind and rain, to break up drip water and to permit rugged sections on parts subject to mechanical damage. Along with the deep inner petticoat, these exterior petticoats gave an overall leakage distance of 17 in., more than 40 per cent in excess of a standard 10-in. suspension. Measured as an integral along the leakage path, surface resistance was 60 per cent greater than for conventional 10-in. units.



Suspension insulator defies smoke and corrosion

Wide spacing between outer petticoats (A), (B), (C) minimizes inter-petticoat sparking; deep inner petticoat (D) acts as flux control, is metallized in pinhole (E) for freedom from radio interference; recessed cement level between porcelain and pin (F) is desirable because of possible corrosion. If inner porcelain were removed as shown by dotted line (x), stress would be tangential to surface, causing discharge over porcelain. Longer space between terminals, shown by line (y), lowers field strength: direction of field is into porcelain rather than over it, tending to prevent discharge

To prevent sparking from the cap of one insulator to flange immediately above it, the shell was given a 10-in. diameter and a 4-in. droop, providing liberal clearances between units spaced at 6½ in. This also helps to avoid short-circuiting caused by drip water between adjacent units near lower end of long suspension strings.

Offered under the trade name "Smogtype," the unit has a dry flashover value of 105 kv., wet flashover value of 55 kv., dry arcing distance of 9.6 in., wet arcing distance of 4.7 in. and an M. & E. rating of 15,000 lb.

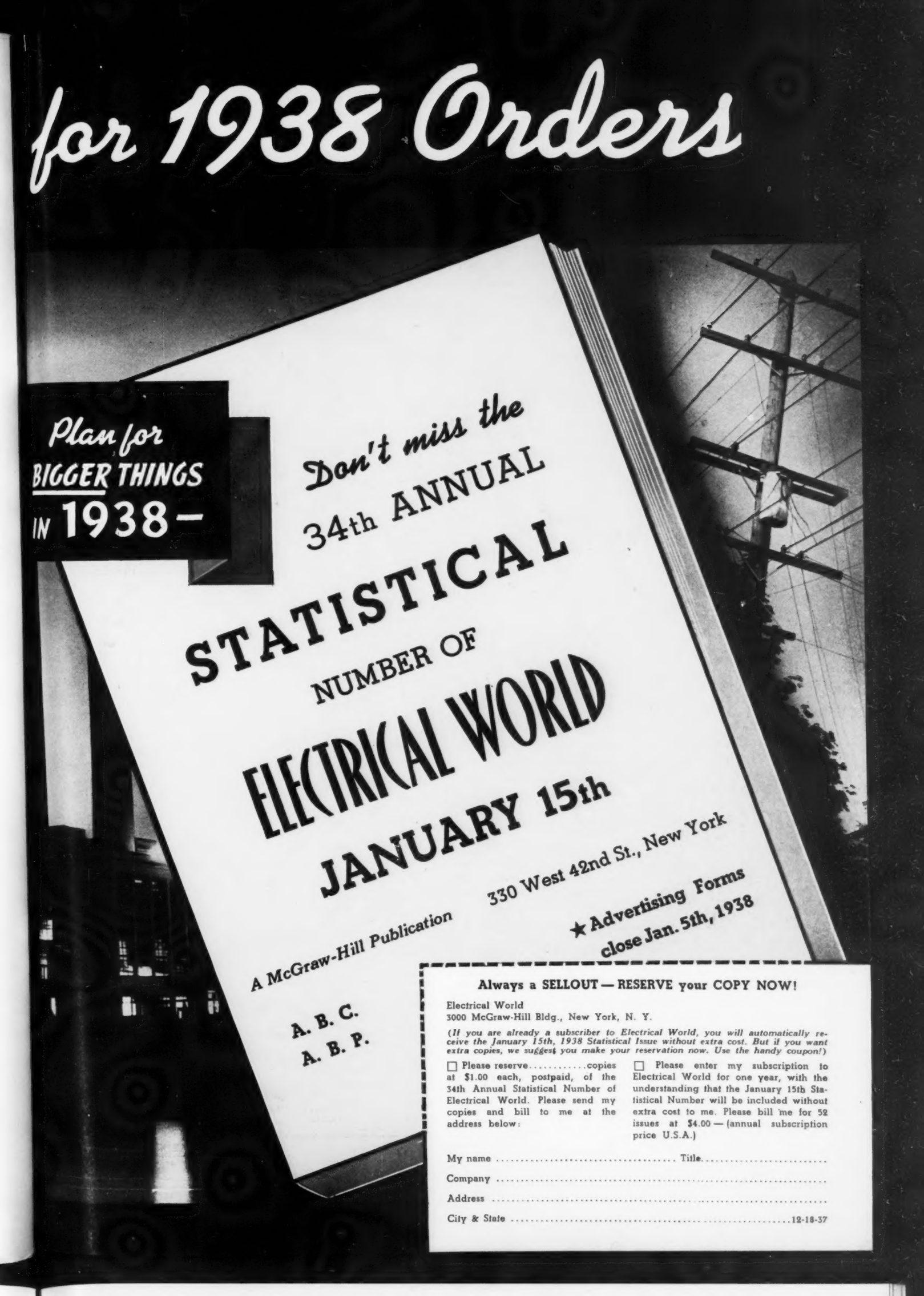
•

Limitations of High-Voltage Insulation

After a detailed discussion of the various features of insulation on overhead and underground transmission and the great progress made by scientific research, J. B. Whitehead reaches the following conclusion (Franklin Institute Journal, Sept. 1937):

It is no new thought that the saving in conductor material at higher transmission voltages is partly offset by the increased cost of insulation. Obviously the higher the voltage the greater the cost of insulation, and the minimum total cost must always determine the most economical value of voltage. In the early days of ascending voltage it was only a question of how much additional insulation was necessary, and the cost of added material. Now, however, we have reached a stage in high-voltage values where the inherent insulating properties of materials are often surpassed in simple forms of assembly, and where physical dimensions are becoming prohibitively great. In order to meet these limitations special forms of construction of the conductor system and special auxiliaries to the insulating system have become necessary, thereby causing not only greater increases in the cost of

for 1938 Orders



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insulation but also clearly marked physical limitations to further elevations of transmission voltage.

•

Nederbragt Cell Tests Oil Stability

By W. A. DEL MAR, J. H. PALMER and E. J. MERRELL
Habirshaw Cable & Wire Corporation, Yonkers, N. Y.

Sixty-cycle glow discharge over the surface of a cable oil seems to give an index to the stability of that oil. The amount of gas evolved, the change in measured power factor and the change in resistivity are gages of the stability of the oil under the influence of electronic bombardment in a cell attributed to Nederbragt. This test is being studied to determine its potentiality as a commercial test standard.

At 1.0 mm. pressure it requires about 12,000 volts to establish a current of 0.8 milliampere through the cell. Gas evolution is measured by the increase in pressure as indicated by a mercury manometer. Test results are reproducible to within ± 5 per cent and, therefore, the cell (Fig. 1) appears a practicable means of (1) classifying oils, (2) determining effects of modifying agents and catalysts, (3) correlating data with load-cycle life tests of cables.

So far the results indicate that, in general, oils having the better gassing characteristics have inferior power factor and resistivity characteristics and vice versa. High viscosity (solid type cable) oils show generally greater deterioration by gassing than oils of low viscosity (oil-filled cable oils), which, however, show greater alteration in power factor and resistivity. Added aromatics reduce gas evolution. Power factor increases occur without increase of hydrophil number and are thus not attributable to oxidation.

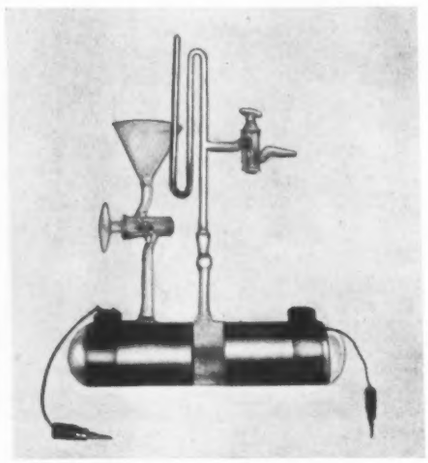


Fig. 1—Oils compared in two cells of this type

Glass cylinder, 50 mm. external diameter with 1.5 mm. wall. Length to hemispherical ends, 250 mm. Tinfoil belts 95 mm. wide and 28 mm. apart. Funnel introduces 20 g. sample of carefully conditioned oil. The manometer shows pressure change under gas evolution. Electrodes are metal foil belts on the outer surface of the glass.

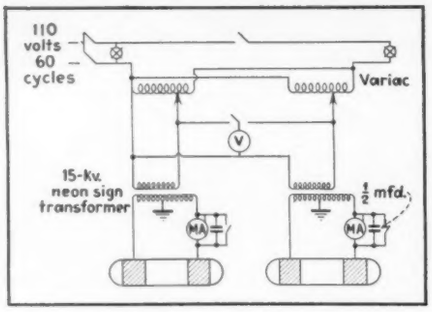


Fig. 2—Sign lighting transformer (15 kv.) applies 12 kv. during test

Adjustable ratio auto-transformer facilitates equalizing currents to comparison cells.

•

Recovery Voltage by Resonance Tests

Behavior of the recovery voltage after short-circuit rupturing can be determined by a high-frequency resonance method without undertaking any short-circuit tests, as reported by P. Fourmarier and J. K. Brown (*Brown Boveri Review*, August, 1937). The method provides for measuring the admittance of the system, seen from the breaker terminals, in function of the frequency. Frequencies of the various natural oscillations of the recovery voltage, their amplitudes and damping coefficients are then determined by calculation. The short-circuit resistance is also determined by calculation from the high-frequency measurements.

The method is said to give the behavior of the recovery voltage as dictated by system conditions when an "ideal" breaker is used. While the cathode-ray oscillograph record of short-circuit openings cannot be subdivided into the various frequencies, the high-frequency measurement method is said to offer the great advantage of giving the various natural harmonics separately.

•

Develop New Alloy of High Permeability

High magnetic permeability and low hysterisis loss are among the claims for a new alloy of iron, silicon, aluminum and other elements, which is readily powdered and made into dust cores for telephone apparatus. The alloy was developed by Dr. Masumoto and associates of the Research Institute for Iron and Other Metals at Sendei Imperial University, Japan. Its initial permeability is 38,000 and it has a maximum permeability of 120,000. Notable is the low hysterisis loss of the alloy, which is said to be 28 ergs per cu.cm. per cycle at 5,000 gausses.

The electrical resistance of other commercial alloys having high permeability in a weak field is low. This tends to make eddy currents large, it is claimed, unless the metal may be rolled into very thin strips. These disadvantages are said to be overcome in the new alloy, which is reported to have a specific resistance of 84 microhms at normal temperature.

Dust cores prepared from "Sendust," as the alloy is called, have a specific gravity of 5.5 ±, according to the size of the powder. It is declared to be very strong mechanically and unaffected by transportation or rough handling, because the dust is bound by a special substance (of an unrevealed nature) and compressed at high pressure.

Magnetic and electrical properties of the alloy were published in *Ohmu*, and are presented in the accompanying table, which also gives properties of other similar alloys. The same laboratory has developed a substitute for super-permeability and "Mumetal," known as NC metal, and appropriate for the cores of relays and a.f. transformers.

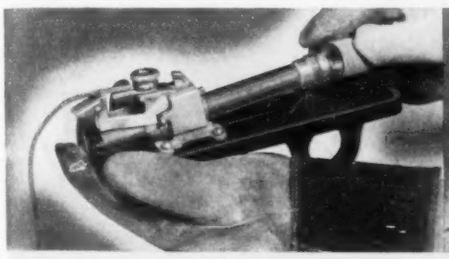
Electrical and Magnetic Properties of Special Alloys

	Initial Permeability	Maximum Permeability	Hysterisis Loss at B 5,000 Ergs	Specific Resistance Microhms Per Cu. Cm.
4 Per Cent Silicon steel	600	6,000	550	50
Ni 78.5 Permalloy	18,000	80,000	70	16
Sendust A	38,000	120,000	28	84
Sendust B	16,000	19,500	10	84

ONE MINUTE* RE-FUSING

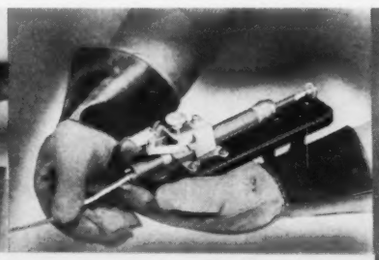
ANOTHER ADVANTAGE OF THE L-M TYPE PVD FUSE CUTOUTS

● Seconds *count* in restoring outages. On-the-pole re-fusing of PVD Fuse Cutouts not only cuts down outage time, it is a safe, easy operation. To start it, your lineman opens the PVD Bakelite Door and lifts it off the dead hinge in one easy motion. And Re-Fusing the PVD is Simple.



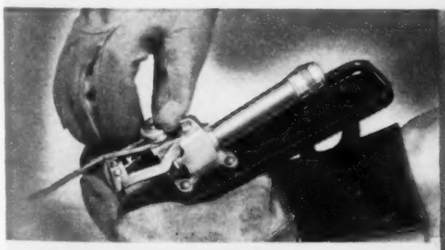
1. REMOVE THE BLOWN LINK

Just unscrew the fuse cartridge cap and pull the blown link out.



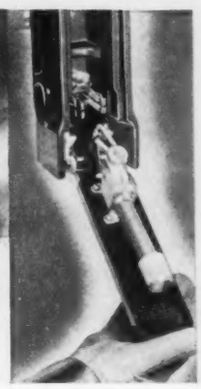
2. INSERT A NEW FUSE LINK

It slides into and through the PVD Fuse Cartridge without a hitch.



3. FASTEN THE NEW FUSE LINK

Pulling new link over the Spring Actuated PVD Throwout Device and making it fast requires a few seconds only.



4. RECLOSE THE PVD DOOR

The PVD Door hooks on its hinge and swings shut in one continuous, easy movement.

* *Six seconds* is plenty of time to re-fuse the PVD when the lineman has a spare fused PVD Door. He just opens the old door, lifts it off and slams on the fused door. PVD Fuse Cutout Doors are perfectly interchangeable.

And there you are . . . . The PROTECTED PVD!

Rain, snow, sleet, dirt and foreign matter don't get at PVD contacts. The PVD Bakelite Door stays closed, sealing out weather and dirt, whether the cutout itself is in fused or blown position.

LINE MATERIAL CO.

Industrial ELECTRIFICATION

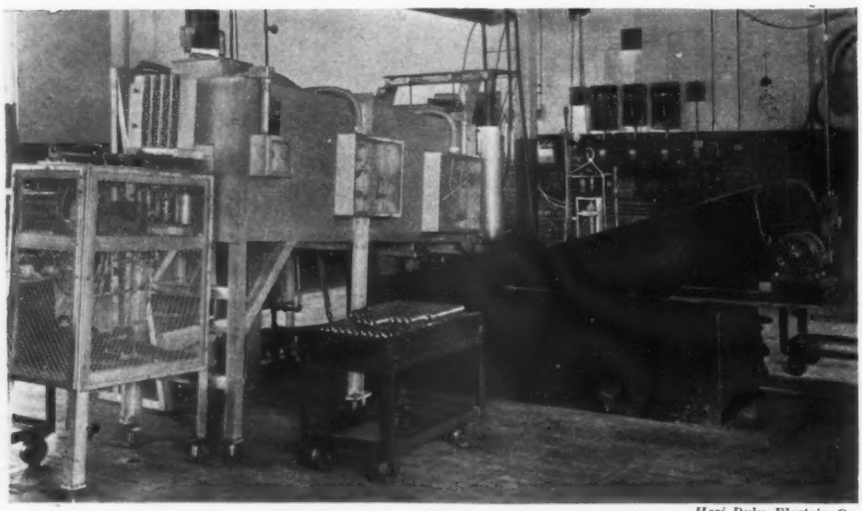
New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers

New Pusher Furnace Completely Automatic

For heat treating "sucker rod" couplings (pieces of round steel 4 in. long, 1 1/3 in. in diameter and weighing about 1¾ lb.) that are used in oil well pumping the S. M. Jones Company has recently installed a pusher type electric furnace that, except for charging a magazine with pieces to be treated, is completely automatic.

The furnace is equipped with a gas curtain at the discharge end and a door for inspection purposes. At the charging end the opening is only large enough to permit the charge to enter the furnace. Each of four V-grooves in the hearth plate terminates in a sectional discharge chute extending through the bottom of the furnace, where an oil seal is provided. This discharge chute is so designed as to cause the sucker rod couplings to drop into the quench end-wise.

Heating time is regulated by an interval timer which can be adjusted from practically continuous operation to one charge every five minutes. The charging mechanism is hydraulically operated. The cycle of operation is simple. As soon as the timer starts the pump motor a pusher cylinder moves the pusher plate forward, until the charge has been moved about 2½ in. from its position under the magazine; 1½ in. of its length still supports the magazine load. Another cylinder is then actuated which elevates four pins that come up through slots in the pusher plate and hold the magazine load in place. At the completion of the forward travel, contact is made with a limit switch, energizing a solenoid-operated valve and returning the pusher plate to its starting position. The other limit switch then de-energizes the solenoid. This limit switch also stops the motor. As the pusher plate returns, the elevating cylinder under the magazine permits the new charge to come into position for the next cycle.



Heri-Duly Electric Co.

Production heat treatment of sucker rod couplings

•

Printing Plant Saves With A.C. Power

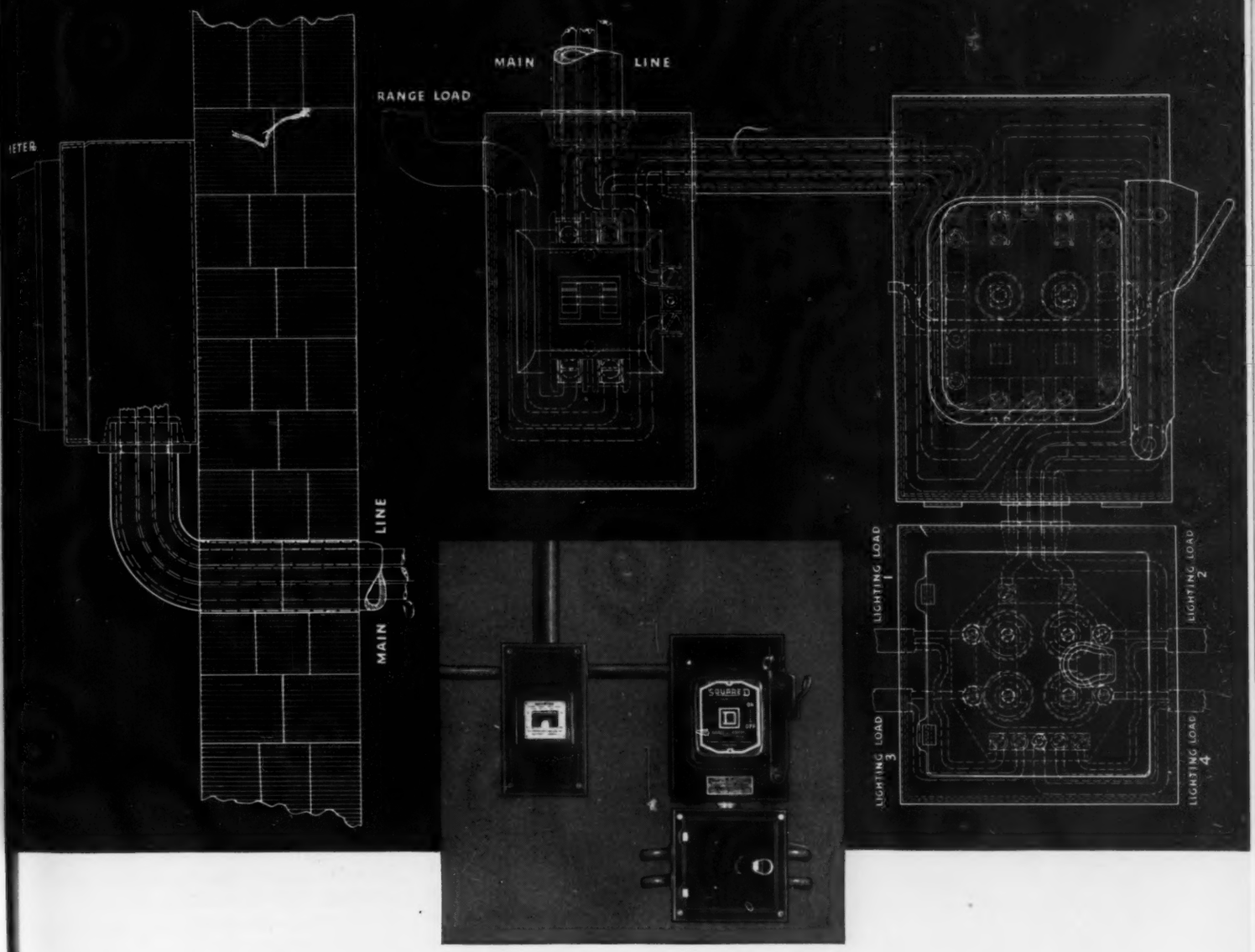
By PAUL OTTO
Commercial Supervisor,
United Electric Light Company,
Springfield, Mass.

Soon after the introduction of electric power the Brooks Bank Note Company, Springfield, Mass., manufacturer of printed products, acquired a number of presses driven by direct-current motors, for which power was supplied by a steam engine generator.

Experience proved, as time went on, that a motor-generator set had to be used whenever it was necessary to make a night run, the set being operated on utility power. Still further growth of the plant demonstrated that it would be much better to purchase all the power and discontinue use of the steam engine.

Among the reasons given for the change the following are probably the most important: conversion losses of the motor-generator set were excessively high. Also, the motor-generator set had so little spare capacity that bad speed variations resulted throughout the plant when one of the large presses was being started, particularly on jogging operations. This jogging produced enough voltage fluctuation so that the lights used in the photo room would vary in intensity and produce erratic exposures.

After considerable study it was found that the alternating-current drive was entirely satisfactory for press drive and also resulted in less trouble



. . . IT IS EASY TO ADD A RANGE OR WATER HEATER CIRCUIT WITH A SQUARE D MULTI-BREAKER

●When the service entrance switch of a home has not sufficient capacity for the addition of electric range or water heater, it is easy and economical to add extra circuits by using a Square D Multi-breakeR. The Square D Multi-breakeR is service equipment and may be installed in parallel with existing wiring.

The 1937 National Electric Code permits up to six service subdivisions or branches, individually controlled with solid mains.

The new two-pole Square D Multi-breakeR sells at a new low price for circuit breaker protection —hardly more than a good switch and fuses. The installation costs less than replacing the service entrance switch with one of larger capacity.

Any Central Station selling electric range or water heater services should investigate this new Square D Type M Multi-breakeR. It has added sales appeal.

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

SQUARE D COMPANY CANADA LTD. TORONTO, ONTARIO

CALL IN A SQUARE D MAN

from maintenance. Elimination of the steam plant and the use of alternating current would permit the establishment to operate without the supervision of an engineer and electrician.

At present alternating-current equipment is being used throughout the plant. The total power load is approximately 150 hp. and is made up of 54 motors, ranging in size from 1/12 hp. to 10 hp. About 10 kw. in heating appliances and about 10 kw. of lighting demand complete the requirements.

A saving in power cost has been realized by the change-over. The October bill for 1936, when purchased power was used with the motor-generator equipment, amounted to $311. This year the bill in August amounted to $198. This comparison for a one-month period only is indicative of benefits to be derived throughout the year.

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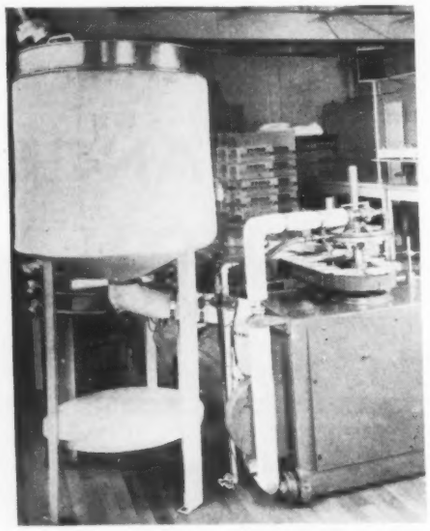
Electric Heat Improves Packaging

Packaging of Zemo ointment has been a difficult problem. Solid at ordinary temperatures, it flows and neatly fills the containing tins when heated



Thermostatically controlled heating elements in filling machine simplify packaging of ointment

correctly, but it will congeal if too cool and mix improperly if too warm. Of course it is important that the ointment be kept absolutely sterile.

These difficulties were overcome by the E. W. Rose Company of Cleveland, makers of Zemo, by building Calrod heating units into the walls of the batch container to keep the pipes that carry the ointment to the filler heads at the proper temperature. Since this method has been adopted the tendency to smear the containers and lids, a characteristic of the cold fill, has been eliminated.

•

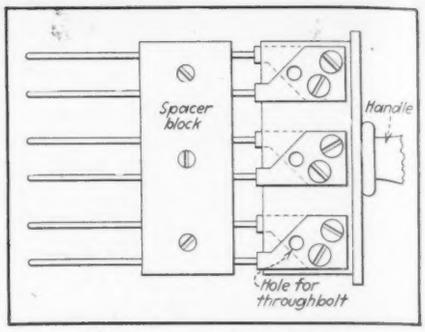
Quick Connections for Motor Testing

By R. B. STRASSEN
Electrical Engineer
Owens-Illinois Can Company, Chicago

Biggest part of the job of testing motors in operation is connecting and disconnecting the instruments. To do this safely and quickly is a problem that has had almost as many solutions as the number of men who have worked on it. And as a matter of fact, the best instrument connection device in any instance is probably the one that was designed to fit the particular case. For example, the one that is shown in the accompanying drawing and which is in regular use in the Clearing (Chicago) plant of the Owens-Illinois Can Company was designed for use with Square D "Saflex" fused dead-front distributing panels, which are largely used in the plant.

In this type of panel connection to the line side of the fuse is made by means of a piece of copper bar bent into U-shape and fastened to an insulating block held in the cover of the panel unit. The block may be set in two positions in the cover; in one position, closing the cover closes the circuit, and in the other the cover may be closed and the circuit remain open. In a three-phase unit there are, of course, identical closing means for the three fuses mounted on the one unit.

The testing connector comprises six flat copper bars or fingers mounted on an insulating body which is provided with a handle taken from an old knife switch. The bars are properly spaced, held for rigidity in a spacer block as shown, so that they will enter the clips of the "Saflex" unit. Alternate bars terminate on the two sides of the insulating body in brass plates which are provided with screws, under whose heads are placed the lugs of the test leads. The matching plates on the two sides of the body are tapped for reception of through-bolts, by which means any of the three pairs of fingers may be short circuited if a series test connection is not desired



Plug for quick and safe motor testing

in that particular phase. With this device all testing instrument connections are made to the terminals of the plug, which is then inserted in the switch clips. Safety is thus accomplished by the elimination of making "hot" connections and speed gained by the fact that test connections remain fixed during a series of tests.

•

Hints on Fusing Control Transformers

By K. B. HUMPHREY
Sayreville, N. J.

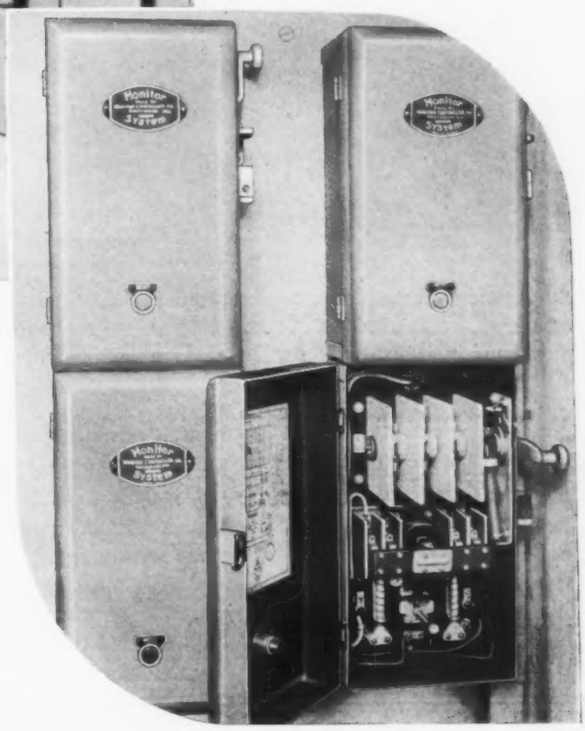
An incident that well illustrates the advantages of properly protecting the secondary windings of auxiliary transformers on motor starters was brought forcefully to the attention of an electrical maintenance crew recently when the secondary winding of a small transformer serving the no-voltage release coil on the starting panel of a large synchronous motor burned out. This transformer was rated at 50 volt-amperes and stepped the voltage down from 2,200 to 110. A 1.3-amp. fuse in the primary leads of the transformer had not blown.

The motor emergency stop button, located at a considerable distance from the motor room, was connected to control equipment by a two-wire BX cable. One side of the low-voltage circuit was grounded, as was the BX sheath. The stop button had become defective and shorted to ground, putting a short circuit on the secondary winding of the transformer and cutting out the release coil. Apparently the resistance of the BX sheath was enough to limit the current in the transformer to a value small enough to prevent the primary fuse from blowing, but large enough to burn out the transformer winding in time.

A fuse of 5-amp. rating was deemed sufficient and was installed to protect the transformer secondary circuit.

Monitor Automatic Control

for CROWN CORK AND SEAL COMPANY



ONE of the world's largest and most modern plants, The Crown Cork and Seal Company's plant at Baltimore, represents advanced thought in machines and methods. Monitor automatic motor controls are used in various departments on many production machines throughout this efficient plant.

Monitor push button control is ideal for production systems such as at C. C. & S. Co. It makes control positive, lowers maintenance, increases production, and protects motor and equipment at all times, assuring a convenient and dependable system of automatic control.

Monitor

AUTOMATIC ELECTRIC MOTOR CONTROL

Monitor builds standard controllers, starters, and accessories and custom built apparatus for any electric motor control problem, no matter how complex. Monitor Sales Engineers in principal cities will gladly consult with you. Write us.

THE above is a photograph of a battery of Monitor combination starters at Crown Cork and Seal Company. To the right is a close up view showing the interior of one of these starters which includes externally operated disconnect switch, three pole double break magnetic contactor, compensated type thermal overload relay with reset button in the cover.

• • •

MonitorControllerCompany

Gay, Lombard & Frederick Sts.
BALTIMORE, MARYLAND

Building Up THE LOAD

New ideas and practices in selling electrical equipment and service to commercial and domestic customers

Luminous Fronts Sell Display Lighting

By GEORGE F. AUE
Los Angeles Bureau of Power and Light, Los Angeles, Calif.

By using its product itself, the Los Angeles Bureau of Power and Light has set a convincing example of the efficacy of illumination for advertising and for beautification. Its new branch office, the first of a number to be located throughout the city, sets a pace in building architecture by using a full glass front, permitting spectacular illumination of the structure by night and a pleasing appearance by day.

The building, 45 ft. wide, 75 ft. long and 31 ft. high, is unusual in the effect gained by streamlining the front pilasters and firewall with sweeping curves. The latter, extending between the pilasters, is of a dark blue vitreous enamel sheet steel. This surmounts the building front composed of 45 transluscent opal flashed glass panels, each slightly over 3 ft. square.

Behind the glass front is a 3-ft. lighting cavity in which are mounted 100-watt frosted globe lamps on 18-in. centers. The lamps are mounted horizontally with the filament toward the panels, permitting a 26-in. separation between the globe and the glass. Each tier of light squares has its own individual vertical reflector, measuring 38 in. from center to center, in which the lights are mounted. The reflector is painted with a flat finish known as luminall, to give even diffusion of light through the glass panels, and is well soldered to the framework to avoid light leakage. The arrangement permits the use of two lamps per square. The glass panels are set in aluminum frames with metal glazing putty, making a waterproof front having a resistance to withstand a wind load of 15 lb. per sq.ft. Convenient handholes and service openings are provided in the rear of the light cavity.

Treatment of the pilasters is similarly handled. On the front and outer side of each a luminous panel, 14 in. wide, is carried from the sidewalk to the top. In these 50-watt lamps are mounted behind pale blue glass panels.

In all, there is a total of 13 kw. of light installed in the luminous front, 9 kw. of which is in the main front and 4 kw. in the pilasters. The installation provides an even intensity of 10 ft.-candles across the sidewalk level, readings being taken in the horizontal plane, after dark.

This use of light as an architectural tool has won international recognition

Selected by the illuminating engineers as the outstanding lighting installation in the United States. It is one of the several branch offices now being built by the Los Angeles Bureau of Power and Light at convenient points throughout the city.

•

"Daylight" Lamp for Color Matching

Until a few months ago efficient color-matching fixtures for commercial use were comparatively expensive, because of the high cost of producing "daylight glass" filters by the hand-blown method. Taking advantage of the recent availability at low cost of blue tinted flat glass suitable for light filters the testing department of the

The "CHIEF'S" NOTE BOOK

IF YOU'D CALL around some day, and ask for "The CHIEF," the chances are that we'd have to ring for him, in the foundry. . . . You know, he's the man who discovered Chromel, 30 years ago—and ever since then he has continued his experiments to make Chromel better. So, in the foundry you find him just about every day. And there, as he supervises the practice of his theories, he observes facts which are recorded in his little black book. . . . Thus, the production of Chromel is continually and critically watched by the man who created it—the original nickel-chromium resistor alloy. . . . Whether you make or sell devices, or sell the power to operate them—these facts are told you to invite your confidence in heating-elements made of Chromel. If you want technical data, send for Catalog-L. . . . Hoskins Manufacturing Co., Detroit, Mich.

HOSKINS
CHROMEL

THE WIRE THAT MAKES ELECTRIC HEAT POSSIBLE

FOR FASTER PRODUCTION OF PLIERS AND SPURS

Improving conditions in any industry are usually accompanied by like improvement in the business of supplying the tools of the trade. Which is undoubtedly the reason for the recent rearrangement of machines and installations of new ones in several departments of the plant of Mathias Klein & Sons, Chicago, makers of pliers, spurs, connectors and other linemen's tools used by electric utilities. Here are some of the new high-speed milling machines on which pliers are ground to size and to true cutting edge.

Commonwealth Edison Company, Chicago, has developed a new form of "daylight" lamp for color matching. The new lamp, shown in the accompanying section, is now being commercially produced and is being regularly sold by the lighting sales department of the company.

As seen in the sectional drawing, the lamp is extremely simple. It consists of a spun aluminum reflector, which constitutes the housing and which is closed at the bottom by the flat glass filter, which may be had in different color saturations to produce various desired qualities of daylight, such as north sky, cloud reflection, direct sun, and others. A regular schedule 150-watt "Mazda" lamp is the light source.

Design of new color matching lamp

New Data on Major Appliance Usage

By C. R. LANDRIGAN
Assistant Controller
Detroit Edison Company

Figures of range and refrigerator loads, generally accepted throughout the industry and widely used for estimating load-building returns, have been questioned in recent years on the evidence of operating records of later models of these appliances. Yet the amount of such evidence was small, thus making it indicative rather than conclusive. To establish the point in actual local experience, the Detroit Edison Company made a full year's check on a representative group of ranges and refrigerators in actual use. From this check, completed in October, 1937, it appears that the modern range and refrigerator each consumes only about 60 per cent of the energy required by models of ten years ago.

Record meters were installed on 43 ranges which included nine models manufactured by five companies and on 30 refrigerators (average capacity of 6.43 cu.ft.), of which there were fifteen models produced by five manufacturers. This provided a diversity of types of equipment which is believed to be essentially in proportion to that of all the ranges and refrigerators on the company lines, except that no three-element ranges were included in the test.

The seasonal trend of both the range and refrigerator load was found to be closely in accord with seasonal variations established many years ago. However, there was a marked decrease in the average use of electricity by both appliances. The following summarized data and accompanying chart show the results of the test:

Average Kw.-Hr. Used per Year	Range	Refrigerator
Family of 3 persons.....	831	
Family of 4 persons.....	928	
Family of 5 persons.....	1,035	
Average of all installations	935	325
Values established in 1928 tests	1,480	542

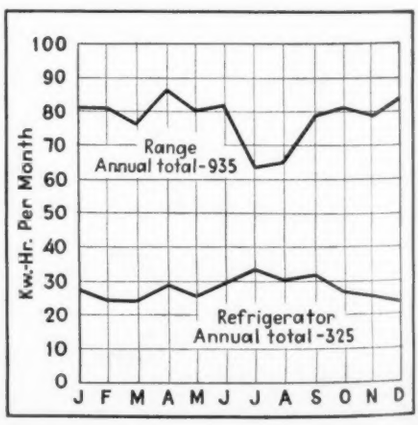
Notes

All appliances in the test were 1936 models in actual service under normal operating conditions.

Test conducted from October, 1936, to September, 1937, inclusive.

The refrigerator test records were originally separated according to family size, but the variation in use of energy between families of three and five persons was found to be negligible.

These results indicate that modern electric ranges and refrigerators use less electricity than older equipment. This means that these appliances bring less revenue to the power company, but it has the advantage of promoting easier sales in competition with other methods of cooking and refrigeration. Also, it frees a portion of the customer's electric dollar for the enjoyment of the newer uses of electricity—water heating, better light, etc. No demand meters were installed for this test because it was felt that there would be no essential change in demand characteristics from data on hand. Recent studies of more than 200 ranges in service in three apartment houses have confirmed this belief.



Analysis of energy usage of modern ranges and refrigerators

Average kilowatt-hours used to operate a range and refrigerator, modern equipment, in use by an average size family, based upon recent study by the Detroit Edison Company.

CENTRAL STATIONS
select
Ingersoll-Rand
CONDENSERS
because of their
PERFORMANCE
RECORDS

A single-pass 27,400 sq. ft. condenser installed in 1928 to serve a 35,000 KW. turbine. Cameron circulating and condensate pumps serve all three units illustrated above.

(Above) A 25,000 sq. ft. two-pass condenser with limited quantity of circulating water serving a 25,000 KW. turbine.

●

(Left) A 100,000 sq ft. single-pass condenser serving a 160,000 KW. turbine.

Features —

All of the I-R installations referred to here are operating with a uniformly high surface efficiency rendered possible by the following features of design:

- ***Heart Shaped Shell***
- ***Differential Tube Spacing***
- ***External Coolers***
- ***Positively Controlled Steam Distribution***

Cameron Pumps

The complete line of Cameron pumps includes circulating, condensate and hot-well pumps, and boiler-feeders for discharge pressures up to 2800 lbs. per sq. in. Other I-R power house equipment includes air ejectors, vacuum pumps, compressors, and pneumatic tools.

OVER a million kilowatts of large Ingersoll-Rand single-pass Condensers (30,000 KW. and larger) installed during the past 15 years, represent an average of 0.7 sq. ft. of condensing surface per kilowatt. Hundreds of I-R multi-pass condensers average less than 1.0 sq. ft. per kilowatt. The generally accepted standard of condensing surface per KW. during this period was about twice these figures.

The Ingersoll-Rand standard for those 15 years has now become the performance standard demanded by modern power plants. Before purchasing condensers rated on this new standard, it will pay you to consider the performance record of past installations, and to investigate the design pioneered and perfected by Ingersoll-Rand. The ability of the I-R Condenser to maintain this more efficient performance over extended periods, and under a wide range of operating conditions has been conclusively demonstrated in a great many Central Stations throughout the country.

566-4

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News ABOUT PEOPLE

Gale Made Vice-President of Chicago Utilities

Willis D. Gale has been elected vice-president of the Public Service Company of Northern Illinois in charge of finances and a similar position with the Commonwealth Edison Company

to succeed Purcell L. Smith, who has resigned.

Since 1935 Mr. Gale has been vice-president in charge of finance and accounting and a director of principal subsidiaries of the North American Light & Power Company. For three years prior to 1935 he held the same positions in the North American Light & Power Company. A graduate of Northwestern University, Mr. Gale served on the teaching staff as an instructor in the Department of Economics. He is a certified public accountant and a member of the Illinois bar.

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▶ MARSHALL E. LAKE, power sales engineer, Duke Power Company, Charlotte, N. C., has been elected chairman of the North Carolina section of the American Institute of Electrical Engineers. He succeeds Prof. Walter J. Seeley of Duke University. Earl C. Dameron, Durham Public Service Company, was named secretary-treasurer to succeed Prof. Otto Meter of Duke University.

▶ DR. HARVEY N. DAVIS, president of Stevens Institute of Technology, Hoboken, N. J., was inducted into office as president of the American Society of Mechanical Engineers, at the annual meeting held last week in New York.

▶ CLIFTON W. WILDER, electrical engineer, who has been connected with the Consolidated Edison Company and predecessor company, New York Edison Company, since 1919, will retire on January 1. A graduate of the Massachusetts Institute of Technology in 1896, Mr. Wilder engaged in general engineering work pertaining to lighting, industrial and railroad properties in Boston and New York until 1907 when he joined the staff of the Public Service Commission for the First District of New York. He resigned from the commission to join New York Edison Company. Mr. Wilder is a fellow of the American Institute of Electrical Engineers.

▶ DR. FREDERICK GARDNER COTTRELL, head of Research Associates, Inc., Washington, D. C., was made the recipient of the Holley Medal by the American Society of Mechanical Engineers. Dr. Cottrell was given this award for the invention of electric precipitation, a process by which injurious dust produced in the refining of minerals is captured, thus preventing it from reaching the lungs of workmen and devastating the surrounding vegetation. For many years Mr. Cottrell has served Government research bureaus and has long been known for his outstanding contributions to chemistry and metallurgy.

C. F. Hirshfeld Awarded Worcester Reed Warner Medal

Clarence F. Hirshfeld, chief of research for the Detroit Edison Company for more than twenty years, was awarded the Worcester Reed Warner Medal for his research and contributions to the theory and practice of heat-power engineering. Presentation was made at the annual meeting of the American Society of Mechanical Engineers in New York last week.

Mr. Hirshfeld has been extremely active in association work, having served as a member of various committees of the American Institute of Electrical Engineers, American Society

of Mechanical Engineers and the Association of Edison Illuminating Companies.

He received an electrical engineering degree from the University of California in 1902 and a mechanical engineering degree from Cornell University in 1905.

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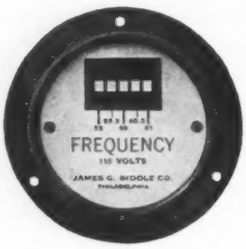
▶ MARSHALL G. MUNCE, managing director of York-Shipley, Ltd., London, recently visited the York Ice Machinery Corporation to inspect latest developments in air conditioning and refrig-

PEACE ON EARTH
GOOD WILL
TO MEN
DEAR _____
SANTA CLAUS ISN'T A PERSONALITY···IT'S A SPIRIT···SAME AS ENTERS INTO A BUSINESS DEAL····AND WHEN THE DEAL WORKS TO THE PERMANENT ADVANTAGE OF BUYER AND SELLER···
·· THAT'S
SANTA CLAUS
All the Members of the
FIBRE CONDUIT COMPANY
wish all their Utility Friends
and Customers···a
Merry Christmas and a
Happy New Year
ORANGEBURG FIBRE CONDUIT

NEW!

a MINIATURE "FRAHM" FREQUENCY METER



FOR indicating power frequencies on small instrument panelboards in central stations and isolated plants, on radio, telephone and testing equipment, and in shops and laboratories, we now offer a *miniature* short-range frequency indicator which is just as accurate and reliable as our well-known wide-range instruments.

There are no pivots, jewels, rotating parts or pointer. Accurately calibrated vibrating reeds indicate the frequency and hold original calibration indefinitely; they are unaffected by wave form or by ordinary variations in voltage or temperature.

Miniature Frahm Frequency Meters have as many as 5, 7 or 9 reeds tuned for any frequency between 15 and 500 cycles per second. Since each reed is tuned separately one can select any range or combination of widely differing frequency values that may be needed.

For further particulars please write for descriptive Bulletin 1415-W.

JAMES G. BIDDLE CO.

ELECTRICAL INSTRUMENTS

1211-13 ARCH STREET PHILADELPHIA, PA.

eration equipment. In Mr. Munce's opinion air conditioning has taken definite hold in England. "There is no doubt," declared Mr. Munce, "that within the next few years restaurants, cinemas and shops will turn rapidly to air conditioning. . . ."

▶ J. W. DUNBAR, formerly in charge of magazine advertising for the incandescent lamp department of the General Electric Company at Nela Park, Cleveland, has been appointed assistant to C. H. Lang, advertising manager. Mr. Dunbar's headquarters are located in New York.

▶ E. A. FISHER has been appointed manager of the household appliance engineering department of Frigidaire Division, General Motors Corporation. Mr. Fisher has been with Frigidaire and its predecessor companies for twenty-one years.

▶ CLIFFORD W. STUART, secretary of the General Electric Company's appliance sales committee and, for the past six months, assistant manager of the G. E. Home Bureau, has been named manager of the Home Bureau. The appointment comes after fifteen years of service with General Electric, during which time Mr. Stuart has been associated with the accounting and publicity departments, and more recently with the appliance and merchandising department. He succeeds Carl M. Snyder, first manager of the Home Bureau, who has been named manager of G.-E. appliance sales. ARTHUR J. LEE has been appointed assistant manager of the Home Bureau. For the past three years Mr. Lee has maintained contacts with builders all over the country, and particularly in the metropolitan area, co-ordinating the various services of General Electric relating to the construction and equipment of homes.

▶ WALTER L. UPSON, professor of electrical engineering in Washington University, St. Louis, on January 1 will assume charge of research for the Torrington Manufacturing Company, Torrington, Conn., giving special attention to fans and air impellers. Professor Upson has been serving in the capacity of consulting engineer for the company for several years and is the inventor of the "Airistocrat" fans, which it manufactures. For a number of years he was consulting engineer for the General Electric Company. Early in his career he was associated with the late Dr. Elmer A. Sperry, inventor of the gyroscopic compass, and later he served as assistant to Dr. C. P. Steinmetz while teaching electrical engineering at Union College. Professor Upson is the author of numerous technical articles and two textbooks on electrical engineering, one of them being written jointly with Dr. E. J. Berg.

▶ J. BURKE SULLIVAN, formerly attorney in the city of Boston law department and recently chairman of the Tax Appeal Commission, has been nominated by Governor Hurley to be chairman of the Massachusetts Department of Public Utilities. He succeeds Abraham C. Webber, who will continue as a member of the board. Mr. Sullivan was named to fill the vacancy created by the expiration of the term of Commissioner Leonard F. Hardy on December 1. Headquarters of the commission have been re-established at the state house in Boston.

▶ J. D. JAMES has been appointed chairman of the Missouri Public Service Commission by Governor Stark, effective January 1. Mr. James will succeed S. O. Hargus, who has been chairman since 1935. Mr. James has been serving as private secretary to Governor Stark. The Hargus term, to which Mr. James succeeds, will expire in 1939. A graduate of the University of Missouri, Mr. James has engaged in the practice of law.

▶ F. O. MCMILLAN, since 1920 professor of electrical engineering, Oregon State College, Corvallis, has been appointed head of the electrical engineering department to succeed R. H. Dearborn, who was made dean of the engineering school last year. Professor McMillan is past-regional vice-president of the A.I.E.E. and has been an active worker on committees of the engineering and operation section of the Northwest Electric Light and Power Association.

▶ CHRISTIAN STEENSTRUP, chief engineer of the General Electric refrigeration department and one of the pioneers in the electrical refrigeration industry, was honored at a testimonial dinner at the Mohawk Golf Club, Schenectady, on December 1 in honor of his sixty-fourth birthday and his completion of fifty years of service in industry. He has been associated with the General Electric Company since 1901. Mr. Steenstrup has been hon-

ored twice with the Coffin Award for outstanding service. He has been granted nearly 100 patents.

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OBITUARY

Joseph B. Groce

▶ JOSEPH B. GROCE, formerly head of the public relations bureau of the Boston Edison Company and at one time director of the New England Bureau of Public Service Information, died at his home in Quincy, Mass., December 10, in his sixty-eighth year.

After some years in newspaper work he became public relations counsel for the Fore River Shipbuilding Corporation at Quincy, returning to this position with the Bethlehem Shipbuilding Corporation, its successor, after leaving the Edison company's service.

"Uncle Joe," as he was affectionately known to innumerable public utility men in the New England area, was born in Hingham, Mass., and was educated at Tufts College.

▶ WILLIAM M. SMITH, who retired this year as chairman of the Michigan State Public Utilities Commission, was killed instantly November 20 in an automobile accident. When the commission was created in 1919 he became its first chairman and served until 1923. He was chosen to head the commission again in 1935 and served until last summer.

▶ ALBERT L. DEGGS, for the past nine years superintendent of electrical maintenance for the northeastern division of the New England Power Company system with headquarters at Lawrence, Mass., died at Lowell, Mass., November 29, at the age of 62. He had been connected with the New England system for about seventeen years.

▶ C. W. S. CRAWLEY, a pioneer in the electrical industry in Great Britain, died in England recently at the age of 79. He was an original partner in the firm of Nalder, Crawley & Soames, whose electrical measurement instruments became so well known under the title of N.C.S. in the early days of electric lighting. When the firm decided to give up the more scientific side of its business in favor of the more commercial, Mr. Crawley left it, devoting his time to advancing the cause of electrical science.

Reliable OFFERS ANOTHER NEW DEVELOPMENT IN LINE SPLICING . . . .

★ The completely non-ferrous splice.

★ The splices and dead ends with tapered wire fitting ends.

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★ Splices and dead ends for type "A" Copperweld.

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THE COMBINATION STRAIGHTLINE SPLICE

Save money by using RELIABLE COMBINATION STRAIGHTLINE SPLICES in urban distribution where a line drops a portion of the load and the next smaller size of wire will carry the current flowing through the rest of the circuit.

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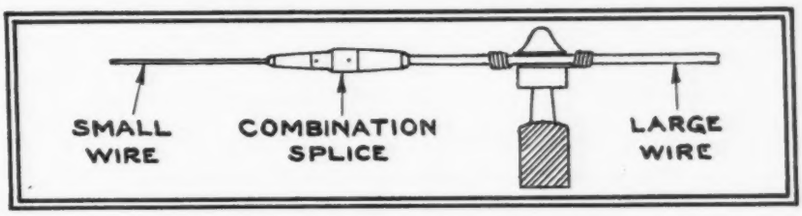

The change of wire size without a double dead end only makes it necessary to increase the sag of the larger wire two or three inches, as the spans of city distribution are short.

RELIABLE COMBINATION STRAIGHTLINE SPLICES have the same design advantages and precision workmanship as the standard Reliable Straightline Splices and Dead Ends.

Reliable ELECTRIC COMPANY

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Manufacturing AND MARKETS

Lower Activity Seen for Electrical Goods

Continued downward trend in orders for electrical equipment is expected to result in lowered activity and profits for the early months of 1938 as compared with corresponding months this year, according to a recent survey by Standard Statistics Company, Inc.

Heavy backlogs of orders received earlier this year are helping many electrical equipment companies to maintain operations at a good rate in spite of the declining rate of incoming orders. It is thought that this will result in fairly well sustained earnings for fourth quarter this year.

According to the survey: ". . . the near-term outlook for electrical equipment lines is not encouraging. On the other hand, electrical manufacturers should participate quickly in any recovery. Utility promotional efforts and the growth of electrification in rural areas are constantly increasing the market for appliances, while the limited amount of utility construction in recent years—even including government projects — despite advances in power output to new highs, points to a need for substantial expenditures by utility companies, awaiting only the combination of a favorable business outlook and a clarification of political uncertainties.

"Because of the time required for utility construction, orders for equipment need not await a high level of industrial activity so long as utility managements are convinced that recovery is on the way."

•

Fair Contract to Sturtevant

B. F. Sturtevant Company, Hyde Park, Boston, has been awarded the contract for air circulating fans, air washers and other equipment to be used for heating, ventilating and air-conditioning the New York City Exhibit Building to be erected at the New York World's Fair. The Sturtevant equipment will circulate 759 tons of air per hour. This building, mainly of glass construction, will cover an area of about two acres.

•

Manufacturers Issue Earnings Statements

Among the electrical manufacturing companies that have recently issued earnings statements are the following:

Sangamo Electric—Nine months to September 30: Net profit $379,744, equal to $2.85 a share on 278,000 capital shares. This compares with net last year of $672,962, or $2.42 a share on stock now outstanding. Profit for the 1937 period includes $57,738 in dividends received from subsidiary companies, but not the company's interest in foreign subsidiary earnings yet to be distributed.

Babcock & Wilcox—Including wholly owned subsidiaries exclusive of company's proportion of undistributed net earnings of companies more than 50 per cent owned, nine months to September 30: Net profit, $944,402, contrasted with net loss last year of $132,949. Including $447,517 company's proportion of undistributed net earnings of companies more than 50 per cent owned, excluded in above figures, total net profit for the 1937 period amounted to $1,391,919, compared with total net profit for the 1936 period of $108,951, which included $241,899 company's proportion of undistributed net earnings of companies more than 50 per cent owned.

•

G. E. Stockholders Increase

General Electric Company will pay its 161st, or fourth quarter, dividend on December 20 this year to 197,104 stockholders, the largest number in the history of the company, W. W. Trench, secretary of the company, has announced. This is an increase of approximately 7,000, or 5 per cent, over the number of stockholders of record a year ago.

Wired Farms Develop Large Appliance Mart

Ralph C. Cameron, who heads the household appliance division, Kelvinator division, Nash-Kelvinator Corporation, sees a $5,000,000,000 market for electrical goods on the rejuvinated farm. "Millions of dollars are going into the purchase of electric washing machines and ironers, electric ranges and electric refrigerators for the farm housewife," Mr. Cameron stated.

"The most closely knit market for electrical appliances," Mr. Cameron said, "is in the biggest farm area—Pennsylvania, Ohio and Michigan. Exactly 300,000 electrified farms, or one-fourth of the nation's total, are expected to be found within the boundaries of these states at the end of 1937. And the housewives in each of these states are preparing to buy some 70,000 electric refrigerators and 40,000 electric ranges this year or next."

•

Builds $60,000 Addition

Signal Electric Manufacturing Company, Menominee, Mich., has superstructure under way for a new two-story addition to plant, 57x130 ft., for which contract recently was let to John Alfredson, Menominee. Structure will be used for expansion in manufacture and is scheduled to be ready for occupancy early in 1938. It will cost approximately $60,000 with equipment.

•

New Refrigerator Market

Sales of electric refrigerators in Turkey during 1937 are estimated at about 2,670 units, of which approximately 2,600 units were of American origin, according to the Bureau of Foreign and Domestic Commerce. In

1933 total sales did not exceed 50 units annually before 1933, the report stated. In addition, according to the report, the American sales this year represent about a 25 per cent increase over 1936, while sales by nearest foreign competitor were about 35 per cent lower.

•

1937 Seen as Record Year for Vacuum Cleaner Industry

Sales of electric vacuum cleaners during 1937 will total about 1,670,000 units, compared with 1,510,953 during last year, estimates the Vacuum Cleaner Manufacturers' Association. Ignoring replacements, this total represents an annual energy consumption of some 40,000,000 kw.-hr., or an annual revenue of around $8,000,000.

Use of cleaners is estimated to have reached 70 per cent saturation in the cities, 30 per cent in smaller communities and much less in farm homes. Replacements and expansion in the larger centers, continued growth elsewhere and rural household purchases in direct proportion to the spread of electrification will give even greater totals in 1938, the association states.

•

Pays Bonus and Dividends

A cash dividend of $1 a share and a special dividend of $4, both payable on December 20 to stock of record of December 13, have been voted by the Electric Controller & Manufacturing Company. This distribution will make the total disbursed from 1937 earnings $8, compared with $5.50 in 1936. F. R. Fishback, president, announced that the board had decided to pay a bonus to all employees.

•

Trane Establishes New Unit

The Trane Company of La Crosse, Wis., manufacturer of heating, cooling and air conditioning equipment, has established a new transportation department in Chicago, Ill.

New York Metal Prices

	Dec. 8, 1937 Cents per Pound	Dec. 14, 1937 Cents per Pound
Copper electrolytic	10.50*	10.25*
Lead Am. S. & R. price	5.00	5.00
Antimony	14.50	14.25
Nickel ingot	35.00	35.00
Zinc spot	5.35	5.35
Tin Straits	43.87	43.75
Aluminum, 99 per cent	20.00	20.00

* Delivered Connecticut Valley.

Field Reports on Business

There has been little change in the electrical markets. Orders for heavy equipment are slow, while household electrical appliances are meeting good sales response. Word from Washington is being awaited as to the Administration's attitude toward the utilities in the future.

NEW ENGLAND

While little change in the electrical market is noted as compared with last week, announcement of several interesting contracts forecasts the buying of a fair volume of electrical supplies.

During the past week B. F. Sturtevant Company was awarded the contract for supplying 42 turbine-driven, forced-draft blowers at a cost of $421,000. This equipment will be installed on seven destroyers now under construction at various U. S. Navy yards. A well-known oil-burning equipment company recently received orders for the installation of units in two institutions in Boston amounting to about $10,000, one of which was 270 hp. capacity to be used for power purposes at a prominent technical school.

Small motor sales are spotty; commercial cooking is active in Rhode Island, where one company's new installations this year will approximate 400 kw. Several new roadside diners have adopted electricity and expansion of city restaurants bids fair to increase this class of service. Increase in lighting plans is noted. The Statler office building in Boston is planning a remodeled lighting installation. The city of Boston has advertised for bids for lamps for general supplies in the school system, for which $8,000 has been appropriated for the coming year.

Merchandise orders for the past week again showed an increase over the previous week; small electric appliances are attracting attention. As compared with last year, electrical appliance buying is maintaining very nearly the same level; however, a strong upward surge of buying in this district is expected during the coming fortnight.

PACIFIC COAST

The Pacific Slope volume of November building permits was the lowest since February, 1936, being 25 per cent below October, 1937, and 10 per cent below November, 1936. Specific decreases of the larger cities over the previous month were Los Angeles 8 per cent, Portland 9 per cent, Seattle 55 per cent, Salt Lake City 40 per cent, the Bay area cities showing a slight gain.

School construction is specially brisk and covers a larger proportion of high schools and junior colleges, with a consequently higher average cost. Outstanding school jobs cover $450,000 alterations for San Jose, which also plans a $2,000,000 school bond issue for February first: $550,000 for Fresno, $40,000 each for National City and Ontario a $1,000,000 junior college in San Francisco, for which a site is under selection, and structures totaling $1,500,000 in Los Angeles and adjacent communities. The usual seasonal increase in hospital construction includes $300,000 veterans' hospitals and additions in San Fernando and Napa, Calif., and Fort Steilacoom, Wash., with a $1,000,000 California state addition now under consideration. The labor situation is outwardly calmer and prices are steadier. The recent rubber wire price decrease of 6 to 7 per cent was expected in view of several bare copper drops. Stocks of all staples are being steadily decreased for annual inventories and the only seasonal line disappointment is radiators, whose demand has been delayed 30 days by mild weather.

NEW YORK

With the Christmas buying season near its peak utilities and retail outlets are concentrating their efforts on household appliances. Department and specialty stores are featuring "electrical gifts" and report a good response.

Decorative outdoor lighting of homes is meeting with good response, with prospects that sales of such equipment will reach a new peak this season. Civic organizations, with co-operation of local utilities, are sponsoring displays as a means of beautifying the community and lending a more cheerful appearance. From a materialistic standpoint such campaigns are aiding the producer, the retailer and the utility.

The normal slowing down of heavy equipment orders at year end is being felt in the manufacturing industry. Reports of utilities indicate that several sizable jobs will be undertaken in the new year. New generating capacity is expected to exceed 1,500,000 kw., which is above the 1937 figure.

The utilities are waiting for an expression from President Roosevelt to the suggestions left with him by Wendell L. Willkie. So far public reaction has been highly favorable to the suggestions. Much-needed utility construction is being held up pending the outcome of the President's move to cut the anchor from the industry and allow it to forge ahead. The importance of a prosperous utility industry in the national economy is being recognized generally.

CHICAGO

Not much change occurred in electrical business during the past week. In most cases sales were considerably below the level of a year ago. However, reports from manufacturers indicate that 90 per cent will have larger sales for the current year than in 1936, due mostly to the heavy volume in the first six months of 1937.

Wholesalers and retailers reported an increase in appliance sales, but it appears unlikely that the volume will even approach that of a year ago. Inquiry at six large department stores reveals that unless an exceptional pick-up in buying occurs between now and the end of the year merchandise inventory will be extremely heavy. Sales have improved during the last week, but are still far below early expectations.

Industrial activity sagged lower and further cuts in personnel and payrolls have generally followed. The resultant drop in the industrial energy load has caused utilities to tighten up on purchases and pursue a more or less hand-to-mouth buying policy, at least until the present uncertain conditions are relieved.

In spite of the unfavorable outlook, a certain amount of optimism prevails. A break in the downward trend is looked for after the start of the new year—just when, no one will hazard a guess. It is generally felt, however, that the administration must, and will, do something to turn the tide, provide the building and heavy industries with the proper encouragement and they will furnish the stimulus necessary for recovery.

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Cleveland Pittsburgh Boston
Richmond Philadelphia Dallas
Los Angeles

Manufacturers Make Sales Assignments

Electrical manufacturing companies have recently made the following assignments to their sales staffs:

A. H. Reinach of Detroit has been appointed head of the recently established commercial sales office on the Pacific Coast by Kelvinator Division, Nash-Kelvinator Corporation, with headquarters in San Francisco. As sales manager of the western commercial division Mr. Reinach will supervise Kelvinator's entire commercial sales activities in a territory covering eleven states and extending from Canada to the Mexican border and eastward to Kansas.

R. V. MacDonald, district appliance sales manager for the General Electric Company in St. Louis since 1933, has been transferred to Dallas in a similar capacity. Mr. MacDonald will succeed F. W. Wheeler, who will assume other duties with the appliance sales organization. B. C. Bowe, who has been district manager of radio sales for G.E. in St. Louis, has been appointed district appliance sales manager to succeed Mr. MacDonald.

A. J. Miller, formerly supply manager of the Westinghouse Electric Supply Company, has been appointed sales manager in charge of all apparatus, supplies, appliances and lamp sales for the New York office. H. W. Petersen has been named supervisor under Mr. Miller, while F. A. Reininger, Jr., has taken up new duties managing the New York sales promotion department.

Ohio Electric Manufacturing Company has recently appointed representatives for the sale of fractional size motors as follows: C. D. Blincoe, Louisville, Ky., H. L. Prather, Minneapolis, Minn., Delavan Engineering Company, Des Moines, Iowa.

B-L Electric Manufacturing Company has appointed The Heimann Company as representatives in Minneapolis, Minn. The Heimann Company will cover the states of Minnesota, Iowa, North and South Dakota and the northern part of Wisconsin in the representation of B-L rectifier products.

Square D Company has appointed Walter H. Bodle assistant to the sales manager. Mr. Bodle was previously in charge of the Indianapolis office of the company. R. W. Thompson is taking Mr. Bodle's place in Indianapolis. Mr. Thompson was previously branch manager for the company at Pittsburgh. A. W. Anderson will assume charge of the Pittsburgh territory.

•

Lighting Course at Columbia to Be Conducted by Powell

The School of Architecture and the Department of Electrical Engineering of Columbia University have collaborated in establishing a basic course, entitled "Illumination of Buildings," which will present the most recent information in modern lighting practice. Topics included are: Co-ordination of light and architecture; fundamental terms of illumination; lighting standards; light control; electric service in the home; color in lighting; commercial, industrial and residential lighting; stage lighting; decorative and exterior lighting, and modern trends and future possibilities in lighting.

A. L. Powell, supervising engineer, incandescent lamp department, General Electric Company, Atlantic Division, will conduct the course, which will be offered for the second time this coming spring session in the evenings, beginning February 8.

•

Rocky Mount Plant Lets Contracts for Expansion

City Council, Rocky Mount, N. C., has awarded a contract to the General Electric Company for a 7,500-kw. turbo-generator unit for installation in municipal power plant, where expansion will be carried out, including direct-connected exciter, generator air cooler and complete auxiliary equipment, at price of $170,000; also for certain switchgear at $16,799. An award for other switchgear has been made to the Westinghouse Electric & Manufacturing Company at price of $44,927.

Other contracts for the project follow:

Surface condenser for the generator unit, complete with circulating, hotwell and dry vacuum pumps, atmospheric relief and accessories, C. H. Wheeler Manufacturing Company, $45,174; three 2,000-kva., 11,950/2,300-volt, single-phase, 60-cycle transformers, Wagner Electric Corporation, $14,049; feedwater heater, Elliott Company $7,754, and for boiler-feed pumps, Morris Machine Works, $5,394.

•

Show 1938 Kelvinator Line

The 1938 line of Kelvinator electrical household appliances is being shown this month to dealers in the United States at previews in the various cities. During the conferences distributors and dealers are discussing group plans for merchandising the new line in their territories, according to Ralph C. Cameron, sales manager of electrical household appliances for Kelvinator.

•

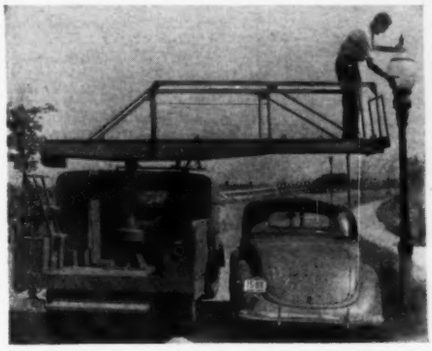
Acquires Patent Rights

Knapp-Monarch Company has acquired the patent rights for the manufacture of an improved type of electric shaver. The new product is now being manufactured in a plant recently acquired for that purpose at Long Island City, N. Y., and is being distributed under the trade name of "Knapp-Monarch."

New EQUIPMENT AVAILABLE

Aerial Ladder

Designed for the servicing of street lamps at any reasonable horizontal and vertical distance from the truck carrying it, a new aerial ladder is pedal locked and may be



"All-Purpose" aerial ladder; weighs 860 lb. and is mounted on 1½-ton truck chassis; delivered weight of 500 lb. obtainable from equivalent type of ladder for lighter chassis. **The Baker-Raulang Co.,** Cleveland.

quickly rotated 360 degrees. For use in a horizontal or semi-horizontal position a catwalk and hand rails are provided; using the hand rails, lamps 18 ft. high and 10 ft. from the side of the truck may be reached. it is said. For high lamps the extension section is brought into use, together with an adjustable platform with safety guard rail. Lamps 31 ft. in height may be reached with two 14-ft. sections.

•

Reducer Line Splice

For use in urban distribution where lighter loads allow smaller conductors to be used in end sections of heavier wire circuits, a new combination straight line splice has recently been placed on the market.

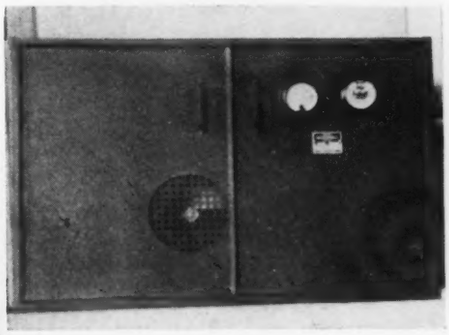
Conductor reducer straight line splice; offered for various combinations of solid and stranded wire in such sizes as ordinarily used in distribution, as No. 4 to No. 6, No. 2 to No. 4. **Reliable Electric Co.,** Chicago.

Usual practice at such points is to dead end two different-sized conductors on a double arm and put a jumper between them. New splice allows straight through connection to be made in line.

•

Gas Detector and Alarm

Designed to operate lights and sirens at any one of several points in an industrial plant when a poison gas may be present in



Continuous gas alarm and detector. **B. O. Bushnell,** Los Angeles.

percentages to endanger life, this new continuous automatic gas detector and alarm is electrically driven and uses the photoelectric cell. Operating in conjunction with a manifold gathering system, the device is said to be responsive to percentages of hydrogen sulfide, for example, lower than 0.0025 and as high as 0.01 per cent.

•

Pin-Type Insulator Clamp

Provided with a clamp for holding the conductor in position, a line of three pin-type insulators eliminates need for tie wires and is said to be free from radio interference at voltages 1.4 to 3 times normal line-to-ground potentials. Malleable iron casting is cemented into porcelain head of insulator and clamp proper rests on two pintles in casting. Since no tie wires are used and head is all-metal, lines of flux pass directly from conductor through clamp and into porcelain. Thus at no point can air become overstressed and cause radio interference, it is claimed. Even in pinhole, air in series with porcelain is eliminated by cementing metal thimble into pinhole.

"Clamptop;" in 10½, 12 and 13½-in. diameters, for ordinary line voltages of 34.5, 46 and 69 kv., respectively; two sizes of clamps, with reversible keeper piece, accommodate conductors from ¼ to 1 in. **Ohio Brass Co.,** Mansfield.

Industrial Spotlight

Intended as a supplement to general illumination, this industrial spotlight is said to build up light values approximating 1,000 foot-candles over such restricted areas

"Intensifier;" adjustable-focus types, from 60-200 watts, using medium-base lamps; fixed-focus, 300-500-watt mogul base types. **Benjamin Electric Mfg. Co.,** Des Plaines, Ill.

as tool points of machines or small areas of work benches. Removable, dead black, internal louvers reduce glare to a minimum. For color correction purposes, a daylight glass cover gives a color temperature of 4,200 degrees Kelvin. Combination of 300-watt daylight lamp and daylight cover is said to give a color temperature of about 5,300 degrees Kelvin.

•

Voltage Regulator

New voltage regulator designed to permit manual compensation of fluctuating a.c. lines provides smooth, uninterrupted control of voltage in steps of about 1.0 volt each. It is further stated to have an ex-

"Type RH Transtat;" models for correcting voltage through range of plus or minus 20 volts from normal on lines of 230 volts or lower; handles line currents up to 35 amp.; types for single- or polyphase operation. **American Transformer Co.,** Newark, N. J.

ceptionally high electrical efficiency, low exciting current and practically no effect on power factor or wave form. In construction, the device consists of an auto-transformer assembled on a core of rectangular cross-section and equipped with carbon brushes which contact commutators formed by the bared surface of the windings.

Photo-electric Cut-off

New photo-electric cut-off attachment may be used with any dial scale to open or shut hoppers, batching equipment, control valves or other units connected with weighing operations. Several units may be used on same dial to obtain combinations and sequence of control; thus one unit might be set for "dribble," the other for complete cut-off. Optical unit is mounted on front of scale and contains a small incandescent lamp shining on the photo-cell. Interception of this ray by the dial arrow operates cut-off through relay unit, usually mounted on rear of dial.

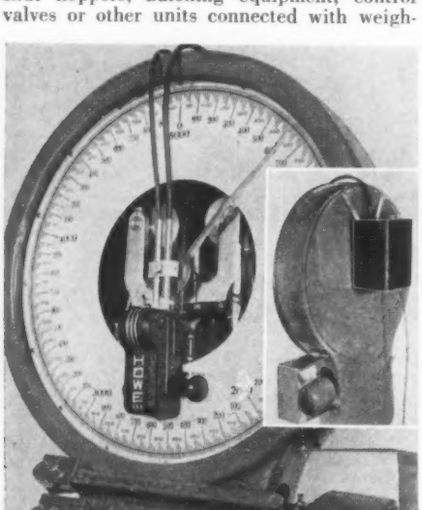


Photo-electric cut-off attachment for dial scales; approximately 40 watts; 110 volts, 50-60 cycles. **The Howe Scale Co.,** Rutland, Vt.

•

Explosion-Proof Motors

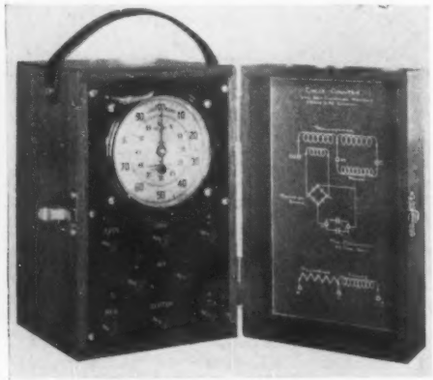
Type AA explosion-proof squirrel-cage a.c. motors. **The Reliance Electric & Engineering Co.,** Cleveland.

A new line of explosion-proof squirrel-cage a.c. motors, tested and approved for Class 1, Group D hazardous locations and with mounting dimentions conforming to N.E.M.A. standards, has been offered recently. All working parts are completely inclosed, housing is said to be strong enough to withstand an internal explosion and rotors are integrally cast.

•

Cycle Counter

This new cycle counter for timing settings of high-speed protective electrical relays has a self-contained rectifier to provide direct current for operation of the electric clutch. According to the makers, it will measure time intervals from 1/200 second to 60 seconds, with an accuracy of 85 per cent of the smallest reading. It is powered with a synchronous clock motor.



Model CC; styles for 110, 220 and 440 volts. **The Standard Electric Time Company,** Springfield, Mass.

•

A.C.S.R. Splice

A new splicing unit for aluminum cable steel reinforced consists of two sizes and types of sleeves—one of aluminum for the outside aluminum strands and one of galvanized steel for the inside steel core, and a practical, convenient tool for making the compressions that form the joints. The aluminum sleeve is slid over the steel splice and then crimped with the tool, which has two die grooves to compress the two sleeves. Tight, uniform, strong joints, having low resistance and high conductivity, are said to result from this method.

"Nicopress" splicing unit for A.C.S.R. Steel sleeve, top, aluminum sleeve and No. 51 tool, bottom. **National Telephone Supply Co.,** Cleveland.

•

Circuit Breaker Control

Manual remote control mechanism for oil circuit breakers; designed for Types FK-42 and FK-143 breakers. **General Electric Co.,** Schenectady.

Of particular interest to those operating oil circuit breakers with a manual remote control should be a new mechanism for this purpose which is said to require 30 per cent less manual effort and to decrease strain on the supporting panel by 75 per cent. By the use of a toggle arrangement in the new horizontal hanger and crank at the breaker, force applied to operating handle is multiplied, due to leverage effect obtained in toggle.

•

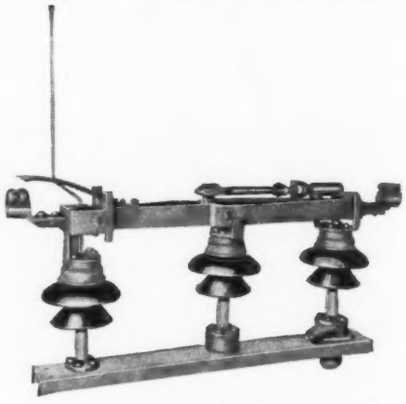
Single-Phase Motors

Type RG; in sizes from 1 to 3 hp., vertical and horizontal types. **Wagner Electric Corp.,** St. Louis.

Salient characteristics of a recently improved line of integral-horsepower, repulsion-induction motors are said to include high starting torque, low starting current, positive starting on low voltage, high power factor. They are suggested for such services as operating air compressors, viscous liquid pumps, refrigerant compressors and conveyors.

Air-Break Switch

High pressure contacts at both ends of the blade, reduced wear and no welding during heavy short circuits are features stated for a new air-break switch. Positive wiping and fixed contact pressure are insured by action and locking of a powerful toggle after the blade enters the contact. Before opening begins contact pressure is completely released. Operating forces are so balanced within the switch itself that strain on the insulator supports is reduced to a minimum.



"Type 8400" air-break switch; available in 400, 600 and 1,200 amp. sizes for voltages from 7,500 to 69,000. **Electrical Engineers Equipment Company,** Melrose Park, Ill.

•

Low-Speed Drill

New ¼-in. low-speed ball-bearing electric drill; full-load speed, 285 r.p.m.; universal motor for a.c. or d.c.; standard voltage, 110, also for 32, 220 or 250 volts. **Black & Decker Mfg. Co.,** Towson, Md.

For use on stainless steel, Monel and other very hard metals, where high-speed drills have a tendency to burn bits, a new low-speed electric drill has a standard spindle of 450 r.p.m. The universal motor used, operating through a triple-reduction gear train, is said to provide ample torgue for the toughest steel-drilling applications.

•

Service Equipment

New service equipment provides in one unit a main switch of the front-operated rotor disk type and both main and branch fuses. Provision has been made for mounting a bell transformer and three Despard type switches below the branch fuse block. To facilitate wiring and inspection, switch and fuse blocks are mounted on metal subbase, removable by loosening a single screw.

Catalog No. 28L2, one of series; 30 amp., 125 volts, 2 poles. **Colt's Patent Fire Arms Mfg. Co.,** Hartford.

Pensions Plan Proposed for British Electrical Workers

A plan for a pensions scheme for the 370,000 workers in the British electrical industry is foreshadowed in the report of a committee of six leaders in the industry, the suggestions including local sick clubs and a fund for cases of misfortune, and limiting the plans at first to male workers in an administrative, technical or clerical capacity. Committee consists of Frank Parkinson, chairman; Lord Hirst of Witton, Sir Archibald Page, Howard Marryatt, W. B. Woodhouse and H. T. Young.

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Bridge Bids Rejected

State Department of Public Works, San Francisco-Oakland Bay Bridge, Division No. 4, has rejected all bids recently received for catenary construction and power feeders of the railway facilities of the San-Francisco-Oakland Bay bridge and will ask new bids for installation in the near future. The lowest bid was tendered by the Alta Electrical & Mechanical Company, San Francisco, at $484,507.

•

Permits New Rural Lines

Pennsylvania Power & Light Company has been authorized by the Public Utility Commission to construct 21 new rural electric line extensions to serve 92 customers in Bucks, Columbia, Chester, Dauphin, Juniata, Lancaster, Monroe, Northampton, Perry, Schuylkill, Snyder and Wayne Counties. The total length of the new lines is approximately 34 miles.

•

Refund Order Now Permanent

Temporary order of the Pennsylvania Public Utility Commission of June 1, requiring utility companies to refund deposits to customers who have paid undisputed bills for twelve consecutive months has been made permanent. The order requires companies to pay 6 per cent on deposits and prohibits deductions for taxes.

An undisputed bill is defined as "one which has been paid without discount or penalty within 60 days following the period for which the bill was rendered, or one that has been paid within 30 days following presentation of the bill."

INSULATION HEADQUARTERS

IT'S A CRIME

To use an insulation that is not *exactly right* for the job

There are actually countless formulae on record here at Continental-Diamond. Each for an insulation of *known* characteristics — each exactly right for some specific requirement. When our Engineering Service Department is asked to produce a material for some unusual service it can draw upon a fund of knowledge and experience unequalled in the insulation field. This technical help is yours for the asking and may be the means of improving your product's performance, reducing manufacturing costs or simplifying assemblies. Write us today.

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Newark, Delaware

Represented in Canada by DIAMOND STATE FIBRE CO. OF CANADA, LTD., TORONTO

DILECTO

A laminated plastic, commonly known as phenol fibre, made in sheets, rods and tubes or fabricated parts to specifications. Has high electrical insulation properties, great resistance to water, practically unaffected by oil or mild acids. It is a strong, tough material with a wide application for use in connection with modern electrical appliances.

DIAMOND VULCANIZED FIBRE

A tough, economical, insulating material made in standard sheets, rods and tubes. Can be readily fabricated or formed. A material of countless applications.

VULCOID

A thermo-plastic, non-hygroscopic insulating material made in standard sheets, rods and tubes. It is strong and tough, has good electrical insulating properties and is readily fabricated.

MICABOND

Thin splittings of mica bonded together with specially developed binders into standard plates, tubing or in formed rings, punched and sawed segments or other special parts. Micabond has high dielectric strength, is practically unaffected by acids, has high heat and moisture resistance, is readily punched, sawed or formed.

CELLULAK

A laminated form of insulating tubing, possessing extremely high dielectric properties, and marked resistance to flash-over.

DILOPHANE

A translucent, laminated plastic in colors. It provides perfect light diffusion, is not inflammable, and is manufactured in practically any color imaginable with either a glossy or dull finish.

The 1937
McGRAW CENTRAL STATION DIRECTORY

Here are the Contents

Names and addresses of independently owned electric light and power companies in the United States, Canada and United States Possessions.

Names and addresses of municipally owned electric light and power systems in the United States, Canada and United States Possessions.

Names and addresses of affiliated, holding, controlling or managing companies with complete lists of properties controlled or managed by each.

Names and addresses of principal officials of holding and managing companies.

Names and addresses of officials and chief operating men for all operating companies including:

Presidents
Vice Presidents
General Managers
Chief Engineers
Electrical Engineers
Mechanical Engineers
General Superintendents
Plant Superintendents
Plant Engineers
Superintendents of Distribution
Superintendents of Transmission
Commercial or New Business Managers
Merchandising Managers
Purchasing Agents
Division or District Managers
Division or District Superintendents
Division Merchandising Managers

For each operating company the following information is presented:

Generator Capacity in kva. or kw.
Kind of Prime Mover and Capacity in hp.
Amount of power purchased in kw.-hrs.
Type of current distributed, number of wires, phase and cycles.
Number of meters served.
Location of power plants.
Location of districts or divisions.
Complete list of towns (having a population of 500 and over) served.

National and State Public Utility Commissions with addresses, names of commissioners and principal assistants.

A complete alphabetical index of companies and municipal systems giving location by city and state.

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The more than 800 pages of handy facts are arranged alphabetically by states and thumb-indexed to facilitate use. Note at the left the type of information that will be constantly at your finger tips. Size—4½" by 8½", bound in tough, flexible covers that resist wear.

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330 W. 42nd St.
New York, N. Y.

Flexible Operation Montville Keynote

[*Continued from page 48*]

In order to keep down maintenance on the boiler safety valves and to reduce outages on this account, a supplementary safety valve was installed in the steam main between the boilers and the turbine. This valve is electrically operated and set to open at 25 lb. pressure below the safety valves on the boilers. Work can be done on this valve at any time because a shut-off valve is incorporated in the safety valve's connection with the steam main.

Turbine, condenser, generator

The 25,000-kw. turbine is the first single-cylinder turbine operating at 3,600 revolutions *of this size* to be constructed. It operates on steam at 650 lb. pressure and 825 deg. temperature made from distilled water circulated in a closed system. The storage tank is located under the turbine and is under vacuum, in distinction to the customary surge tank for this purpose that is under pressure. Evaporation equipment and distilled water storage are provided as well. The condenser has 20,000 sq. ft. of condensing surface.

The 25,000-kw. turbo-generator is rated at 29,400 kva. at 85 per cent power factor and delivers three-phase energy at 11 kv. to a 30,000-kva., three-phase transformer in the switch yard. There are neither circuit breaker nor disconnecting switches between the generator terminals and the transformer primary, which are joined by nine single-conductor cables.

As a commentary on recent advances in electrical design, it may be noted that the cubical air space in this 25,000-kw. generator is no greater than in the 10,000-kw. generator built thirteen years ago. Thus it was possible to utilize for the new generator the carbon-dioxide fire protection system provided in 1924 for the No. 3, 10,000-kw. generator. The condensing water pumps circulate the cooling water for the air-cooling system, which is of the closed recirculating type.

For normal operation excitation is supplied from a 120-kw., 250-volt, 3,600-r.p.m. exciter with a 2-kw., 250-volt pilot exciter, both coupled to the generator shaft. The emergency exciter unit is a 1,160-r.p.m. motor-generator with an induction motor and exciter having the same ratings as the main exciter and its pilot exciter.

Tie-line voltage regulation

Since the purpose of the Montville-Meriden tie line is to transfer various quantities of power in *either direction*, provision has been made at the Montville end of the line for varying the voltage between 59,000 and 80,000. In order to accomplish this, a

66,000-volt voltage regulator has been installed. It is rated at a maximum of 42,000 kva.

Auxiliaries for the new unit are all electrically driven and in general equipped with 2,300-volt, full-voltage starting motors energized from a 2,300-volt bus which has two sources of supply. Under normal operation the bus is energized through a bank connected to the 11-kv. leads of the new unit. For starting up and in case of emergency, the bus can be connected to the existing 11-kv. station bus through a second bank. These two transformer banks are interlocked so that they cannot be connected to the 2,300-volt station service bus at the same time. Motors of 7½ hp. and less are operated 220 volts, supplied through two transformer banks energized from the 2,300-volt station service bus.

•

Southern Canada Power Reports Year's Progress

A record output of 256,710,630 kw.-hr. for the year ended September 30 is reported by the Southern Canada Power Company, Ltd., and is an increase of 24.6 per cent over the all-time record output established in the previous year.

During the same period the number of customers increased from 27,214 to 28,366. Gross sales of electrical merchandise amounted to $380,306, as against $306,000 in the previous year.

•

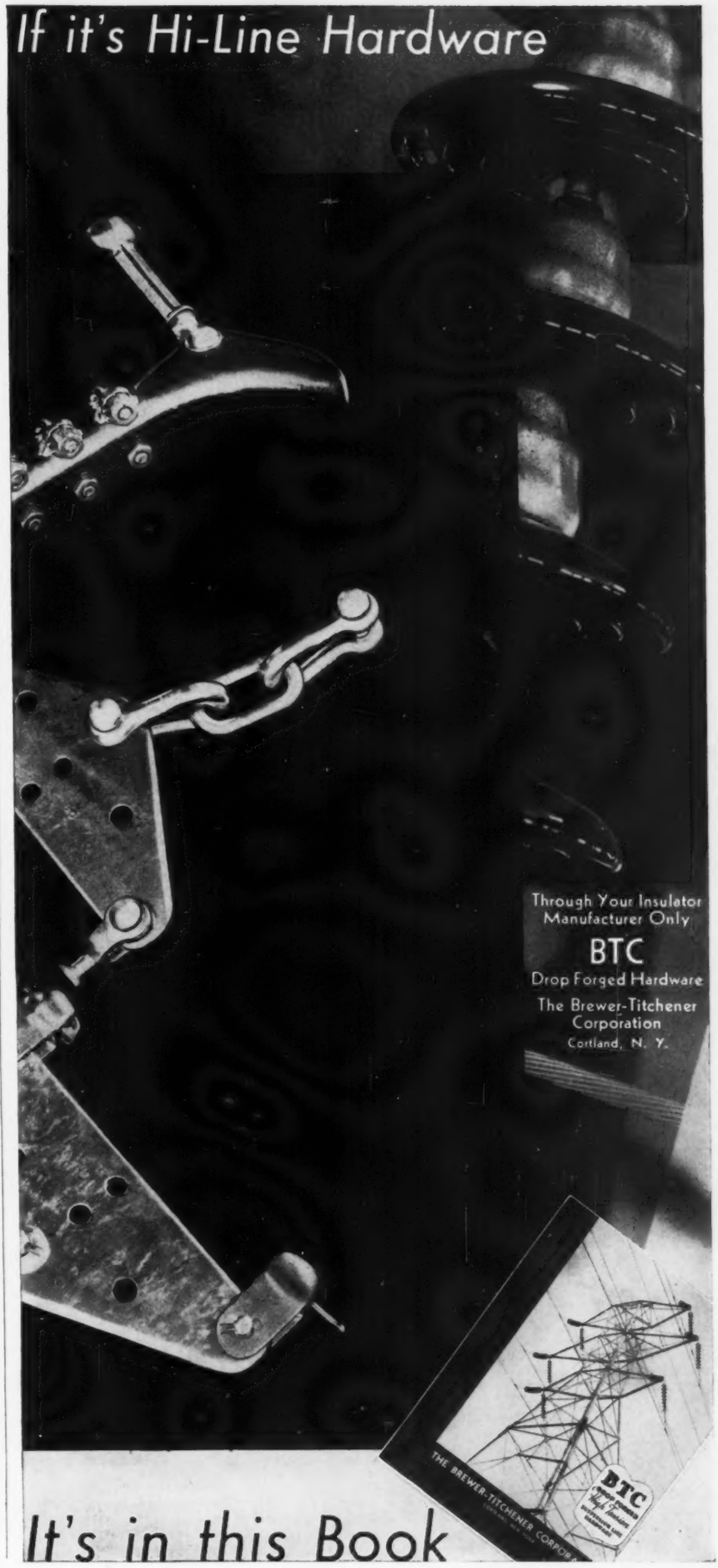
South Wales Merger Proposed

Twenty municipal authorities in South Wales have agreed upon a plan for amalgamating their electrical utilities under a plan that involves the buying outright of the private undertakings in the area of the amalgamated authority. A somewhat similar amalgamation, embracing all undertakings in North Wales, Shropshire and part of Cheshire and including the North Wales power system, was recently announced (ELECTRICAL WORLD, November 20, page 124).

•

Give $50,000 to University

United Gas Improvement Company and the Philadelphia Electric Company have been announced as contributors of $25,000 each to the University of Pennsylvania Bicentennial Fund.



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THE FOSTORIA PRESSED STEEL CORP.

FOSTORIA, OHIO

Wisconsin's Power Needs to Double in Ten Years

[*Continued from page 50*]

Dependable capacity by the end of 1938 will amount to 812,244 kw. This is exclusive of capacity which might be purchased from utilities in other states.

The estimated demand for the next ten years was increased by 25 per cent to provide for reserve capacity. On this basis the 1940 estimated demand of 814,000 kw. would require 1,017,000 kw. capacity, which is about 205,000 kw. in excess of capacity now under construction or to be completed by the end of 1938. The additional dependable capacity can be obtained by new construction or purchased capacity.

Replacements in the next decade are not expected to reach large proportions as older plants are still serviceable and afford an economical means of providing reserve capacity. As new plants are built, they will assume the base load, with the older capacity being assigned to peak-load service.

•

Customers to Read Meters

Dispensing with the expense of a meter reader, members of the Pioneer Rural Electric Co-operative near Urbana, Ohio, are being taught to read their own meters. On the day previous to the reading a "clock" card is mailed from the home office. The clock is marked to show the exact position of the hands by the customer and returned. Out of 2,965 customers, only five were delinquent in October, officials announced.

•

Flathead Project Advancing

Completion of the first unit of the Flathead power development on the Flathead River, 6 miles below Polson, Mont., by June 15 next year is reported. First unit of the project, being handled by the Rocky Mountain Power Company, will develop 77,000 hp. The dam is almost completed, tunnels are being bored and work on power house is well along, according to the report.

•

Toledo Salesroom Enlarged

Toledo Edison Company will expand its general salesroom, almost doubling its present quarters, C. D. Proctor, vice-president and general manager, has announced.

Sales Opportunities

SPRINGFIELD, OHIO—Ohio Edison Company is arranging fund of about $4,830,000 for expansion and improvements during 1938, including extensions and replacements in generating stations, transmission and distributing lines, power substations, switching stations and other structures. A portion of appropriation will be used for extension in rural electric system.

ALLENPORT, PA.—West Penn Power Company, Pittsburgh, will proceed with extensions in transmission lines and facilities at Allenport and vicinity for power service for mills of Pittsburgh Steel Company at that place, for which permission recently was secured. Work will include about 10 miles of transmission and distributing lines, installation of new 6,000-kw. automatic power substation at steel mill site and enlargement of power substation at Charleroi, Pa., where additional equipment will be installed. Cost close to $100,000.

BONNEVILLE, ORE.—Pennsylvania Salt Manufacturing Company, Widener Building, Philadelphia, Pa., plans installation of motors and controls, regulators, conveyors, electric hoists, loaders and other equipment in new plant in vicinity of Bonneville, where large tract of land has been acquired, for production of sodium chlorate and allied chemical specialties. Contract is being made for power supply from hydro-electric power plant of Government at Bonneville dam, now in course of construction, and transmission line will be built to new plant site, where large power substation will be located. Entire project reported to cost in excess of $600,000.

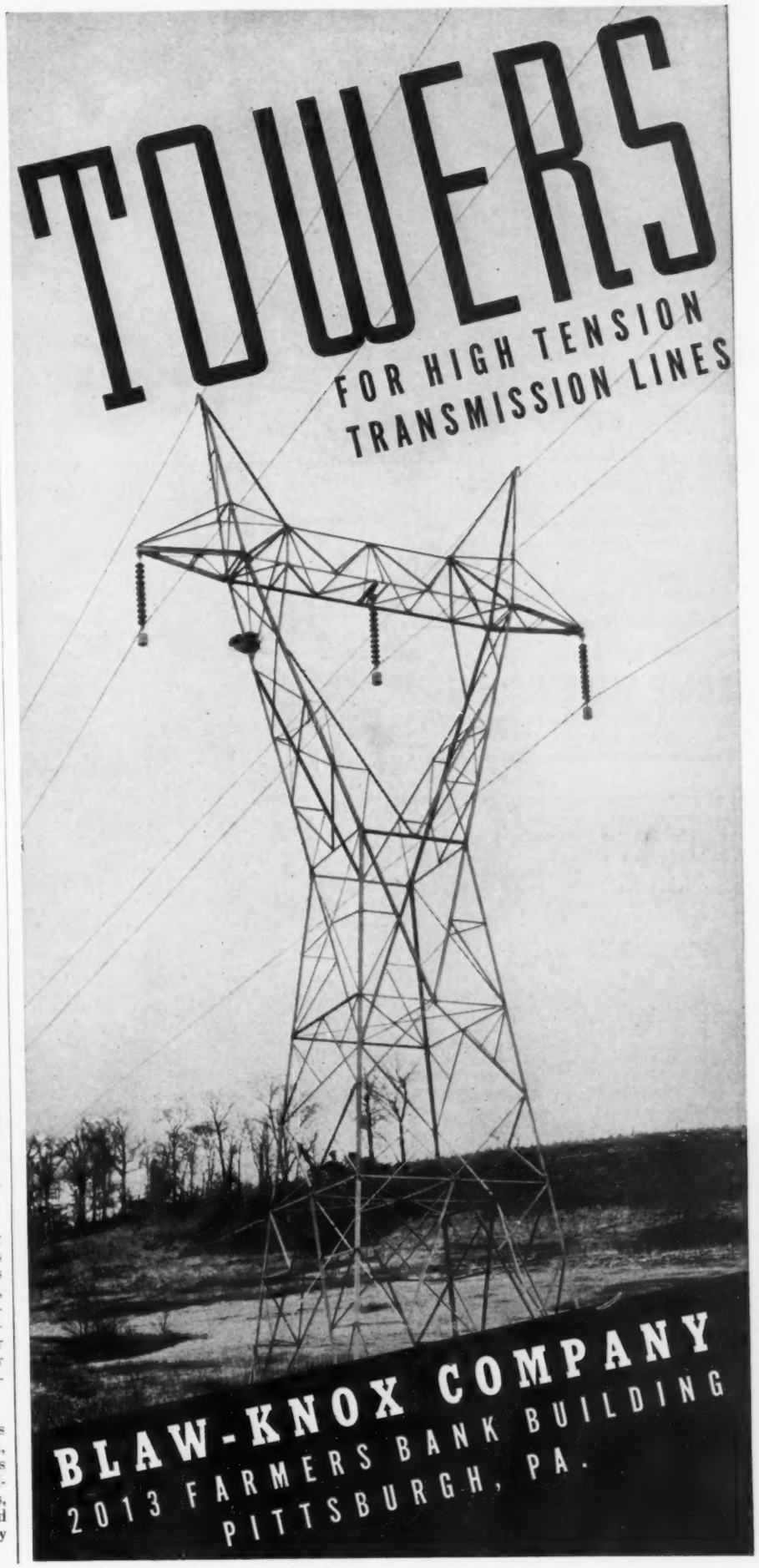
BROOKLYN, N. Y.—Signal Corps Procurement District, Army Base, 58th Street and First Avenue, receives bids until December 24 for 770,000 feet of wire, 57,000 feet of cable and 23 reels (Circular 79).

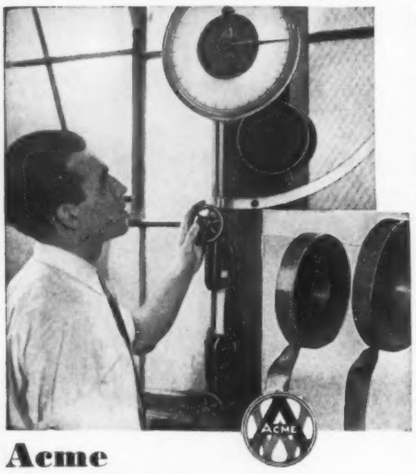
BRENHAM, TEX.—Has plans maturing for new municipal electric power station, with installation to include three Diesel engine-generator units and auxiliary equipment. An electrical distributing system and street lighting system will be installed. Entire project will cost about $310,000. Proposed to begin work soon. Garrett Engineering Company, Houston, Tex., is consulting engineer.

LOUISVILLE, KY.—Louisville Gas & Electric Company has authorized a new outdoor power substation for feeder service in vicinity of Taylorsville Road, where company has tract of 25 acres, about one-fifth of which will be reserved for new station. Cost close to $100,000 with transformers, switchgear, transmission line extensions and other facilities.

CHICAGO, ILL.—International Harvester Company, 606 South Michigan Avenue, plans installation of heavy-duty and other motors and controls, switchgear, electric hoists, conveyors and other equipment in new one-story addition to plant on West 31st Boulevard, totaling close to 240,000 sq.ft. of floor space, to be used for motor-driven tractor production. Cost about $1,000,000. Completion is scheduled next May.

SAN FRANCISCO, CALIF.—Owens-Illinois Pacific Coast Company, 1855 Folsom Street, San Francisco, a subsidiary of Owens-Illinois Glass Company, Toledo, Ohio, plans installation of motors and controls, regulators, conveyors and other equipment in proposed new bottle and container plant in vicinity of San Francisco. Cost over $100,000.





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. . . COMPLETE LISTS COVERING INDUSTRY'S MAJOR MARKETS

CHILLICOTHE, MO.—Has plans maturing for extensions and improvements in municipal electric power plant, with installation of new turbo-generator unit and accessories, boilers and other equipment. Cost about $300,000. Proposed to ask bids soon. Henrici-Lowry Engineering Company, West Tenth Street Building, Kansas City, Mo., is consulting engineer.

PHILADELPHIA, PA.—Bureau of Yards and Docks, Navy Department, Washington, D. C., receives bids (no closing date stated) for motor-driven air compressors with capacity of 5000 cu.ft. of air per minute, for Philadelphia Navy Yard (Specifications 8633).

CORPUS CHRISTI, TEX.—Barnsdall Refining Company, Tulsa, Okla., plans installation of motors and controls, transformers and accessories, electric-operated pumping machinery, conveyors and other equipment in new multi-unit oil refining plant at Corpus Christi for bunker fuel and gasoline production. Work will begin soon. Cost close to $3,000,000.

CABIN CREEK JUNCTION, W. VA.—Pure Oil Company, 35 East Wacker Drive, Chicago, Ill., plans installation of motors and controls, conveyors, regulators, electric pumping machinery and other equipment in connection with extensions and improvements in oil refining plant at Cabin Creek Junction. Entire project will cost close to $1,000,000.

PEABODY, MASS.—Has plans maturing for extensions and improvements in municipal electric power plant, including installation of additional equipment. Cost estimated about $50,000. Arthur L. Nelson Engineers, 31 St. James Avenue, Boston, Mass., are consulting engineers.

MOUNT VERNON, MO.—Lawrence County Electric Co-Operative, Inc., Mount Vernon, has plans under way for primary and secondary lines for rural electrification system in parts of Lawrence and neighboring counties, totaling about 150 miles, with outdoor power substations and service facilities. Cost $150,000. Financing has been arranged through federal aid. Bids will be asked soon. Sverdrup & Parcel, Railway Exchange Building, St. Louis, Mo., are consulting engineers.

CHICAGO, ILL.—Continental Can Company, 100 East 42d Street, New York, N. Y., plans installation of motors and controls, conveyors, electric hoists and other equipment in new one-story machine and mechanical shop, 100x400 feet, at South Ashland Avenue and 37th Street, Chicago, where property has been acquired and will be modernized and equipped at early date. Cost over $100,000.

MEMPHIS, TENN.—Board of Water and Light Commissioners receives bids until December 21 for transformers, switchgear, wiring and other equipment for two power substations. Cost estimated at $230,000, including station structures.

•

Opposes Acme Power Project

L. B. Schiesz, vice-president and general manager of the Northern Indiana Power Company, has opposed a preliminary permit by the Federal Power Commission to the Acme Engineering Service, Inc., of Fort Wayne, Ind. The project would include three dams and two power houses on the Salamonic River.

Recent Rate Changes

NORTHWESTERN ELECTRIC COMPANY has reduced its electric rates in Clark County approximately 8.5 per cent. The cut follows new schedules carrying smaller reductions for residential users in Vancouver, Camas and Washougal and will save rural residential users thousands of dollars annually. Under the new rates for residences and farms outside the Vancouver-Camas rate zone customers will get 15 kw.-hr. for the $1 minimum charge. The next 25 used per month will be billed at 5½ cents per kilowatt-hour, the next 100 at 2.7 cents and anything over at 2 cents per kilowatt-hour. Translated into dollars and cents, the schedule works out as follows: 15 kw.-hr., $1, saving 10 cents; 25 kw.-hr., $1.55, saving 20 cents; 40 kw.-hr., $2.38, saving 26 cents; 100 kw.-hr., $4, saving 26 cents; 150 kw.-hr., $5.28, saving 33 cents, and 200 kw.-hr., $6.28, saving 68 cents. Coincident with the new rural residential schedule, a new rural commercial service rate will be put in effect. It carries a slight reduction, but will have little effect because of scarcity of county consumers in the commercial classification.

ELMIRA LIGHT, HEAT & POWER CORPORATION has proposed to file a new schedule of reduced electric rates provided that the present rate proceeding against it be closed. This recommendation has been approved by the New York Public Service Commission. The reduced rates which the company will file will save its customers $50,100 a year. Of this amount, $24,500 will be saved by residential consumers, $17,000 by commercial users and $8,600 by those who use electricity for power purposes. The new residential electric rate will be a minimum bill of $1 for the first 14 kw.-hr. or less, 5 cents per kilowatt-hour for the next 29 kw.-hr., 3 cents per kilowatt-hour for the next 57 kw.-hr., 2 cents per kilowatt-hour for the next 100 kw.-hr. and 1½ cents per kilowatt-hour for all use in excess of 200 kw.-hr. per month. The proposed new rate for general commercial electric service is a demand rate with a minimum charge of $1.25 per kilowatt of demand and energy charges of 7 cents per kilowatt-hour for the first 50 hours' use of demand, 3½ cents per kilowatt-hour for the next 50 hours' use of demand, 2½ cents per kilowatt-hour for the next 100 hours' use of demand and 2 cents per kilowatt-hour for use in excess of 200 hours' use of demand. Proposed rate for power service is a demand charge of $1.35 per kilowatt for the first 100 kw. of demand and $1 per kilowatt for all over 100 kw. of demand. The minimum charge is the demand charge and the energy charges are 1.8 cents per kilowatt-hour for the first 10,000 kw.-hr., 1.5 cents per kilowatt-hour for the next 15,000 kw.-hr. and 1.1 cents per kilowatt-hour for all use in excess of 25,000 kw.-hr. per month.

NEW YORK POWER & LIGHT CORPORATION has filed with the Public Service Commission electric rate schedules making general reductions in rates for commercial, industrial and other non-residential customers in the cities of Gloversville, Johnstown, Amsterdam, the villages of Fonda, Fultonville, Fort Johnson, Galway, Hagaman, Broadalbin, Mayfield, Northville, Speculator and surrounding towns in Fulton, Montgomery, Saratoga, Schenectady and Hamilton counties. It is estimated that revisions now filed will save commercial and industrial users in this area a total of $39,946 a year.

ALABAMA PUBLIC SERVICE COMMISSION has announced a reduction in rates of the Baldwin County Power Company, estimating customers would save $3,044 annually under

the new schedule. Percentage reduction, the commission said, "will be 13.5, and no customer will be affected adversely." The new rate schedule is effective January 1. Baldwin Power Company purchases wholesale from Alabama Power Company.

•

Municipal Plants

HALEYVILLE, ALA.—Residents voted, in effect, against TVA power recently by a vote of 309 to 209. The town voted in a special referendum not to sell bonds to build a distribution system to sell TVA power. Alabama Power Company supplies the town.

FORT PAYNE, ALA.—By a ballot of 432 to 310 voters approved a bond issue to build or acquire a municipal system to distribute TVA power. The city has proposed to issue $200,000 in bonds for the system and to sign a twenty-year contract with TVA for electric energy.

MORNING SUN, IOWA—City Council has advertised for bids on the construction, furnishing and complete installation of a complete municipal electric light and power generating and distribution system, estimated cost, $65,200. Council will meet to consider the bids on January 3. At the same time it will also consider bids for purchase of revenue bonds of the system.

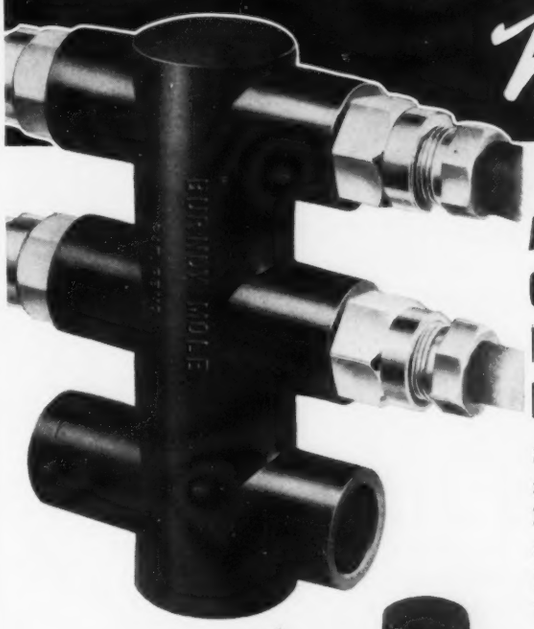
PRIMGHAR, IOWA—Petition asking for a temporary writ of injunction has been filed by a group of citizens in the district court at Primghar, against the town of Primghar, the Mayor, the Councilmen and the clerk, alleging that the purported special election held May 25 pertaining to the construction of an electric light plant and distribution system was illegal, invalid, void and of no force and effect. Petition sets forth that the question submitted to the electors was uncertain, misleading and ambiguous. Petition further alleges that contracts dated November 2 and executed by the defendants and L. A. Kepp as L. A. Kepp Contracting Company, providing for construction of the plant and distribution system, was and is also unlawful, invalid and void, and asks that special election and contracts be annulled and set aside.

HOISINGTON, KAN.—Judge Richard J. Hopkins of the U. S. District Court has dismissed the suit of the West Missouri Power Company to stop the city from proceeding with the construction of its own electric generating and distribution system.

WILLIAMSTOWN, KY.—Representatives of the Community Public Service Company and the city met with the Public Service Commission at an informal hearing to determine if the commission has jurisdiction to issue a certificate of convenience and necessity to a city seeking to build a municipal power plant. "The question is of great importance to Kentucky municipalities that are planning to build their own power plants," J. A. Krug, chief consultant for the commission, said. Unless the Public Service Company and the city of Williamstown can agree on the question of jurisdiction a court fight will be necessary to determine the commission's power, Mr. Krug said.

HOWARD LAKE, MINN.—Attorney-General William S. Ervin of Minnesota has ruled that a village may go into the electric business in competition with a private utility company, provided the latter has not been granted exclusive franchise privileges. Emil A. Wegner, village attorney, stated that a twenty-year franchise has been granted to

The BURNDY Mole



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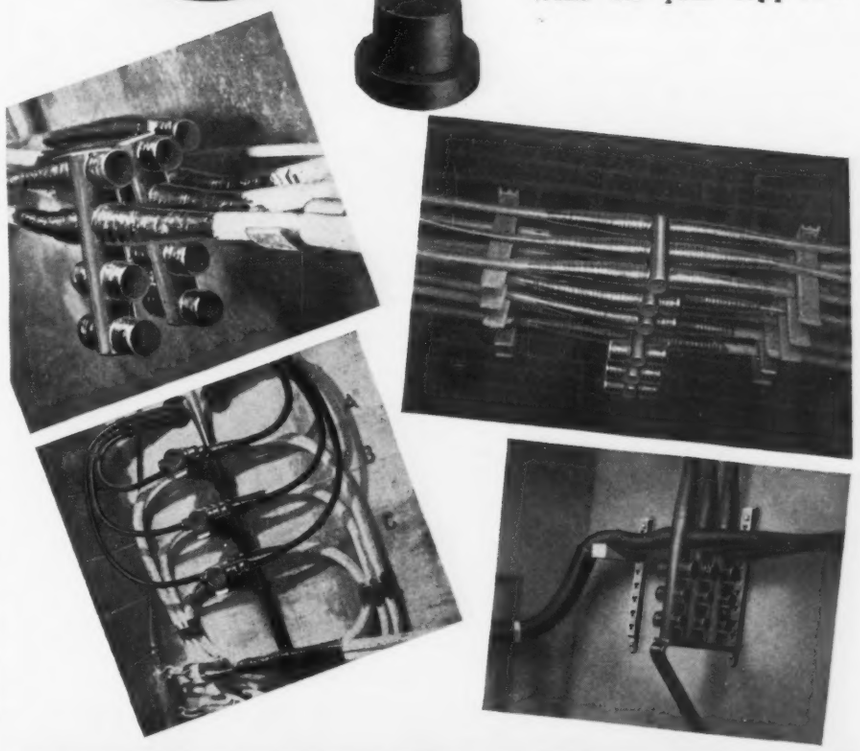

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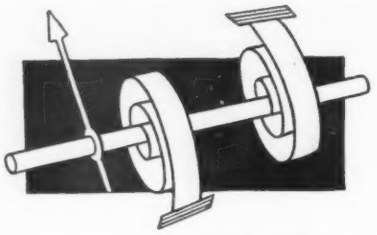

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Northern States Power Company, but explained exclusive privileges of operation were not included. In the absence of this clause, Attorney-General Ervin said, the village has the authority to erect its own plant.

MINATARE, NEB.—Federal District Judge T. C. Munger has granted the Western Public Service Company an order restraining the city from proceeding with erection of its own electric light and power distribution system. The Public Service Company asked for a temporary injunction prohibiting the city from receiving bids on construction, but the court said it would not decide the matter until "a full hearing of the case on its merits." The cost of the project is estimated at approximately $30,000.

DESHLER, NEB.—Dispute between the village and the Southern Nebraska Power Company was carried to the state Supreme Court on the company's appeal from an order of the District Court of Thayer County, enjoining it from continuing to maintain a distribution system in the village, which now has a plant of its own. The company claims its former franchise is still good and the village says a valid franchise no longer exists. The utility lost out in a former suit to enjoin the village from letting contracts for a competing plant, but the franchise question was not at that time decided. The village contends that all rights under the original franchise, which ran to the Deshler Light, Power & Heating Company were forfeited when the holder sold the plant to Southern Nebraska Power without having, as its terms provided, offered it to the village first. The company maintains that that was twenty years ago, and a forfeiture cannot be declared at this late date. The court deferred action.

NELSONVILLE, OHIO—Columbus & Southern Ohio Electric Company has obtained a temporary restraining order to halt the sale of $90,000 in bonds by the city for improvement of its municipal electric light plant. The company contended that sale of the bonds and use of the money on the plant would constitute a misapplication of funds and an abuse of corporate powers. The bond issue was authorized by an ordinance of council and the ordinance was approved by a majority of voters on November 2.

WEATHERFORD, TEX.—Proposal to issue $600,000 revenue bonds to construct a municipal electric light and power plant, water reservoir and distribution system was carried at a recent election by a vote of 474 for and 228 against.

•

Proper Illumination Needed for New York State Highways

Lack of proper illumination of rural roads at night was cited by Robert Maloy of the New York State Motor Vehicle Bureau as one of the reasons for the greater number of automobile accidents in up-state New York than in New York City. The report indicated that less than 200 miles of the state's 85,000 miles of improved highways are illuminated.

According to Maloy, "Only one of 47 accidents is fatal in New York City, as compared to one of 27 in up-state cities and one of eleven in rural New York."

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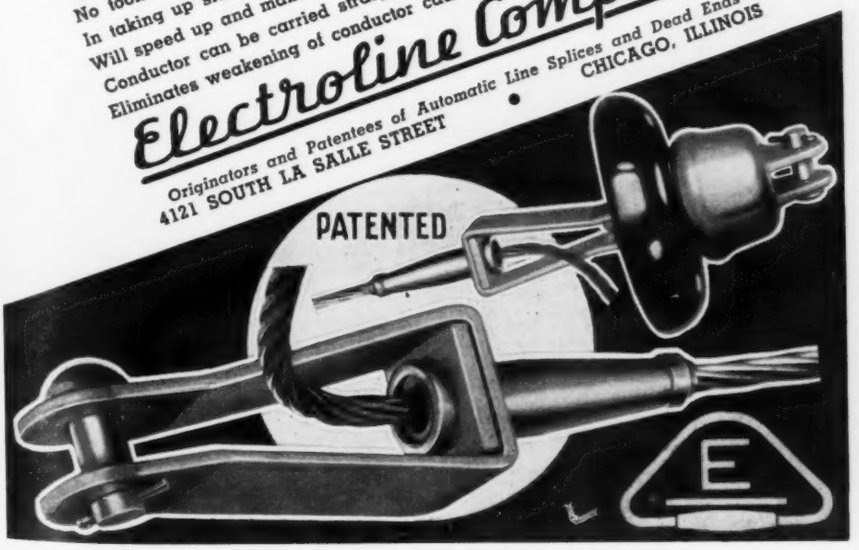

Unit Installation Costs for White-Way Lighting

[*Continued from page 49*]

of the circuits at midnight. The latter was decided upon for two reasons. The first cost was considerably less and the 30-kw. regulators were standard for the other overhead street lighting circuits, making it unnecessary to stock another size spare regulator.

The new lights were installed in a distance of nine blocks. Spacing of lights was approximately 100 ft. A total of 15,525 ft. of cable was installed in the two circuits.

Rubber, lead and jute cable rated at 8,000 volts was used on this job. We have experimented with various types and voltages of cable since 1918 and decided to standardize on this cable. We have installed non-metallic and steel-taped cables with voltage rating from 2,000 to 5,000 and the result is that very few of the circuits will stand the full voltage of a 20-kw. regulator. The difference between the cost of high-voltage cable and low-voltage cable i small compared with the increased maintenance cost of the lower voltage cable.

Includes all but overhead

In compiling cost data on this street-lighting installation we found it advisable to figure in money rather than man-hours for the reason that material and use of a truck had to be considered However, on items where common labor alone is used this is figured at 50 cents per hour, which was the prevailing rate for labor at that time. A foreman and assistant were on the job all the time and their rates were 73 cents and 62 cents respectively.

The table on page 49 presents a complete record of costs except for overhead, which amounted to about 8 per cent of the total cost. Figures on labor were taken from daily time slips turned in by the foreman, who, with his assistant, worked along with the other men, and their time is included in the costs. Transportation was figured at 50 cents per hour for a 2-ton truck with winch. This truck was on the job at all times and was charged at this rate whether it was used or not on the various jobs. Figures on transportation were obtained by prorating according to labor. The cost of supervision was the labor and transportation of the supervisor and was also prorated according to labor.

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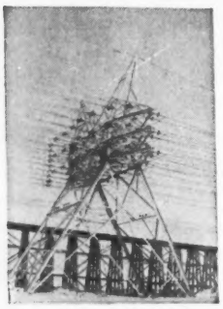

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TONG TEST
AMMETERS

Winter Voltmeter Errors Befog Regulator Settings

[*Continued from page 52*]

deg. C. below room calibration temperature. Many of the more accurate dynamometer type have temperature compensation windings that reduce errors from self-heating (if left connected in the circuit) and from ambient changes to a negligible factor. But the moving element is heavy and the pivots do not stand up so well for transportation and field handling. It takes an hour or more for an instrument to warm up or cool down, so the error with the more usual uncompensated meters is a variable one. Voltage surveys frequently develop some puzzling inconsistencies and the temperature effect will help to explain some of them.

Older voltmeters may not have the same characteristics as the later ones and a check calibration at some low temperature—with and without zero readjustment—is desirable. For survey work the more rugged types of voltmeters can be obtained at slight extra cost with temperature compensation which will reduce the error to 0.1 per cent for 10 deg. C. departure. This is desirable for the wide ranges of temperature found in field work.

The important thing is that, while we may calculate regulator compensation settings very closely, it is even more important to know what the true facts are. And the true facts in this case will, in many areas, enable us to carry higher voltage levels, give better service and maintain our sales, with a negligible expenditure.

•

Applies for Power Permit

Pigeon River Lumber Company, Grand Rapids, Wis., has filed with the Federal Power Commission application for a license for a power project on the Pigeon River located in Cook County, Minnesota, and the Province of Ontario, Canada, which affects lands of the United States and tribal lands within the Grand Portage Indian Reservation. The Pigeon River constitutes part of the international boundary between the United States and Canada.

Included in the project is a power house with installed capacity of about 5,500 hp. located on the Canadian side of Pigeon River; a 110,000-volt transmission line and other appurtenant works.

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Fuse-Breaker Correlation Fixed by Fault Ratio

[*Continued from page 54*]

nominator $\frac{(PT)}{2}$ as there is only one temporary fault in the combination, which of course could cause a maximum of only one outage for the combination of two faults. From the theory of combinations,

$$TP+PT+PP+TT=1$$

therefore

$$TP+PT+PP=1-TT \text{ or } 1-T^2$$

The above expression can therefore be reduced to

$$\frac{(PT)}{(2)}\times\frac{(1-T^2)}{(TP)}$$

Summing up these terms denoting permanent faults and temporary faults causing outage produces the following expression for the relative number of outages resulting from permanent and temporary faults beyond the installation of a two-element reclosing cutout:

$$\text{Outages}=P+\frac{T^2}{2}+\frac{(PT)^2}{2(1-T^2)} \qquad (1)$$

Where

Outages = ratio of outages to total faults.

This simplifies to:

$$\text{Outages}=\frac{P}{1-T^2} \qquad (2)$$

In a similar manner the operation of a three-element fuse can be analyzed with the following results:

$$\text{Outages}=P+\frac{T^3}{3}+\frac{(P^2T)}{(3)}\times\frac{(PT^2)}{(1-T^3)}+\frac{PT^2}{3}$$

$$\times\frac{(P^2T+2\,PT^2)}{(1-T^3)}+\frac{PT^2}{3}\times\frac{(PT^2)}{(1-T^3)} \qquad (3)$$

This simplifies to the expression:

$$\text{Outages}=\frac{P}{(1-T^3)} \qquad (4)$$

Continuing this method of analysis for fuses having four and more elements and comparing the results discloses the following general expression for outages as a function of the number of reclosures:

$$\text{Outages}=\frac{P}{1-T^n} \qquad (5)$$

where number of reclosures = n-1

The curves in Fig. 2 were obtained from the curves of Fig. 1 by simply subtracting the values given by the curves in Fig. 1 from 100 and replotting, using the number of automatic reclosures as the abscissae rather than the ratio of temporary to total faults.

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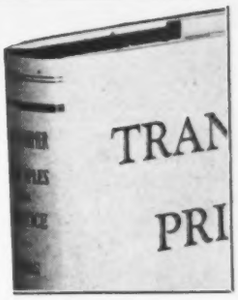
Transformers

— their kinds — fundamentals — uses — operation — maintenance



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Industrial Transformers Made Fireproof

[*Continued from page 55*]

having great moisture resistance for the conductor insulation.

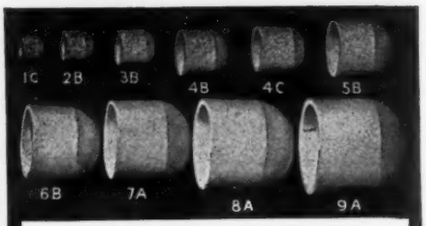
The transformer has relatively high overload capacity because the copper losses at full load are so much less than in the conventional oil-insulated transformer and because no Class A insulating materials are used. The ratio of losses is inherently low because of design characteristics. For example, greater spacing between high- and low-voltage windings is required to obtain the necessary dielectric strength, since only air is used for the insulation; to obtain the same reactance, this means a correspondingly larger magnetic circuit and hence fewer turns.

This results in a higher iron loss and, for the same total losses, a much lower copper loss; consequently, the ratio of copper loss to iron loss is inherently lower.

To check its moisture resistance, the transformer was moved out of doors and given a rain test for sixteen days, with a water spray having a precipitation of 0.2 in. per minute applied sixteen hours out of every 24. Power was left off one-third of the time, since it seemed likely that water might do more damage to the insulation if the transformer were cold than if it were excited. Immediately after these tests the regular A.I.E.E. dielectric tests were applied and withstood successfully.

The adequacy of the mechanical construction of the windings of the 500-kva. transformer was determined by short circuiting the low-voltage winding with the primary voltage sustained at approximately 12,000 volts. Short-circuit currents of 15,000 amp. in the secondary winding were repeatedly obtained for periods of approximately ten seconds. The core and coil assembly showed no indication of looseness or of other mechanical distress.

About twenty air-cooled transformers of the type described in this article have been built to date in various ratings for industrial applications. They are particularly adapted for use in buildings and industrial establishments where oil or toxic fumes are undesirable. They are not submersible. Their dimensions exceed slightly those of the corresponding oil-insulated transformer, but they are inherently lighter in weight.



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The House With the Golden Windows

[*Continued from page 58*]

While there is no way to check the amount of current actually used for lighting, the average residential use shows a healthy growth, in which home lighting certainly has an important part. In 1936 it was 83 kw.-hr. above 1935 and for the first half of 1937 the growth is at the rate of about 75 kw.-hr. per year. This year's I.E.S. lamp campaign has not yet shown its ultimate effect. Rate changes have invalidated a direct comparison of average residential revenue.

Lighting load vital

A most important result is the appreciation and acceptance of home lighting by all departments of the company as a vital part of the utility business. Another intangible is the broad educational effect on all classes of customers. In their whole attitude toward lighting, it should continue to bear fruit for years.

Good will has also been created. For example, the absolutely unconditional gift of a night light to all newborn babies created an attitude toward the company that will not soon be forgotten. And when a customer is shown that a 100-watt I.E.S. lamp will give more service and comfort than some old 300-watt indirect fixture, he heartily appreciates that there is more to this movement than a selfish attempt to increase his bill.

From its experience in this work the Wisconsin Power & Light Company has reached the following conclusions about home lighting:

1. It builds profitable residential load, at reasonable cost, at satisfactory pace, and, if right methods are used, improves trade relations with other outlets. It, therefore, has all of the qualifications for a successful load-building program.
2. The program must have interested and continued *executive direction*.
3. Sustained and diversified efforts are more economical and effective than sporadic and isolated campaigns.
4. Well-prepared plans are an advantage.
   (a) To the homes by bringing the many real advantages of better seeing conditions.
   (b) To the utility by increasing net revenue for more dividends to stockholders and more compensation to employees.
   (c) To dealers, distributors and manufacturers by increasing their business and their net profits.

All who actively participate may profit by the cultivation of this market. Only lack of interest and failure to co-operate may retard the actual realization that the well-lighted home in every town is indeed "The House with the Golden Windows."

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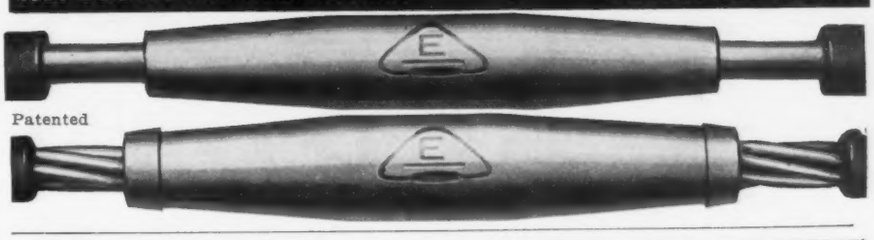

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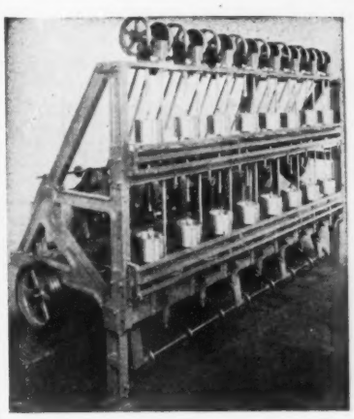

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